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ABSTRACT

The Pennsylvania Preschool Inventory (PPI) was developed as a straight-forward and efficient measure of the relative cognitive development of the young child, offering an alternative to more complicated, elaborate assessment instruments. Results of the inventory are potentially relevant to both current and future school success of children between the ages of three and six. Although the young child's socio-behavioral, creative and motor abilities are also strongly related to academic achievement, the cognitive area was deemed of foremost concern in the assessment of early school experiences. The purpose of the Pennsylvania Preschool Inventory is to furnish a cognitive assessment device, incorporating the qualities of practicality, accuracy, and reliability. The 61 items are divided into six separate sections: Passive Vocabulary, Complementary Relationships, Noncomplementary Relationship, Number Concepts, Verbal Analogies, and Awareness of Self. The Testing Manual includes complete instructions for administration; and standardization and technical information, such as a description of the test construction and standardization procedures, information on scoring and interpreting the test, norms based on Title I eligible children, and reliability and validity data. The Test Plates are the pictures used for administration of the PPI. (Author/BW)

The Pennsylvania Preschool Inventory
TESTING MANUAL

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INTRODUCTION

The Pennsylvania Preschool Inventory (PPI) was developed as a straightforward and efficient measure of the relative cognitive development of the young child, offering a viable alternative to more complicated, elaborate assessment instruments. Results of the inventory are potentially relevant to both current and future school success of children between the ages of three and six. Although the young child's socio-behavioral, creative and motor abilities are also strongly related to academic achievement, the cognitive area was deemed of foremost concern in the assessment of early school experiences. Cognitive development is of crucial importance to the educational success of disadvantaged children, such as those in programs funded under ESEA Title I. However, standardized measures of cognitive functioning appropriate for use with preschool children are relatively rare. The purpose of the Pennsylvania Preschool Inventory is to furnish this type of cognitive assessment device, incorporating the qualities of practicality, accuracy, and reliability.

Although the PPI may be appropriate for use with all children, the current normative information presented in the TABLES section of this report was drawn from samples of ESEA Title I eligible children only. When using the tables of norms, therefore, the appropriateness of the match between children tested and the current normative sample needs to be considered carefully.

TEST DESCRIPTION AND PROCEDURES

Description of the Test

In order to minimize some common difficulties encountered in using standardized measures with young children, yet assure a reliable cognitive measure, the Pennsylvania Preschool Inventory's administration and scoring procedures have been designed with brevity and simplicity in mind. No technical knowledge of testing is required to administer the PPI. All instructions for giving the test are included in this manual. The inventory is to be administered on an individual basis; the accuracy and reliability of a cognitive measure such as the PPI can often be jeopardized when young children are tested in a group. Administration time is approximately fifteen minutes and the answer sheets are easily recorded and scored by hand.

A series of 61 items divided into six separate sections comprises the test inventory. These sections are Passive Vocabulary, Complementary Relationships, Noncomplementary Relationships, Number Concepts, Verbal Analogies, and Awareness of Self. The format of the instrument utilizes a predominantly pictorial stimulus-response set, eliciting, for most items, nonverbal (psychomotor) responses. For each item, the child's response is marked correct or incorrect. The number of correctly answered items is recorded as the total test score.

Examiners should take care to familiarize themselves with the information in this manual before beginning to test. This preparation will make the testing experience much easier and help assure optimum reliability and validity of results.

Before Beginning

Before beginning to use the PPI, there are a few simple rules which should be read carefully and remembered. It may take some practice attempts before

you are sufficiently at ease to begin actual testing of children. Following these rules will help you to avoid potential problems which could arise during the testing situation.

1. Have a specific testing area set aside during your testing program. Although even a corner of the room will do, make sure the area you have chosen will be relatively quiet and free from distractions.

2. Reread your manual carefully close to the testing time. This way the material will be fresh in your mind, and no confusing delays will mar your presentation to the child.

3. Make sure all your materials are readily available: test manual; test booklet; score sheet and two pencils.

4. During the testing period, relax! Show an interest in the child and in the task at hand. Be free with your praise of the child's work, but don't be patronizing--children are easily aware of false praise. ENCOURAGE RESPONSES, BUT DO NOT GIVE CLUES TO THE CORRECTNESS OF ANY RESPONSE. If the child asks, "Was that right?" simply say, "You're doing very well" or "I can't tell you the answers because that would spoil the game for another time."

5. Most important, to be fair to each child, GIVE THE DIRECTIONS EXACTLY AS THEY ARE WRITTEN. Saying more than is written gives some children an unfair advantage.

Setting-Up For Testing

Arrange two chairs across from each other over a low table. Make sure the child will be able to see the test booklet without shifting or straining. Before bringing the child to the test table, arrange all the necessary materials. Keep the test plates booklet closed until you are ready to begin the test.

Recording Responses

For each child that is tested, fill out the score sheet with the required information before you begin. The spaces at the top of the sheet allow a considerable amount of information to be consolidated for each child. Even if all personal data spaces supplied on the score sheet are not filled in at the

time of testing, be sure at least that the child's name and address are recorded so that no confusion as to the identity of any score sheet will result.

The PPI score sheet has been designed to be a simple and efficient method of recording test answers. For each item of the test there is a corresponding set of response alternatives. A key to the correct responses should be scored as correct or incorrect in the appropriate space on the score sheet. In addition, the letter identification or the actual content of incorrect responses may be recorded on the score sheet at the appropriate place. The places available for marking these responses are arranged in columns with each column representing a separate section of the test: Passive Vocabulary; Complementary Relationships; Non-Complementary Relationships; Number Concepts; Verbal Analogies; and Awareness of Self. In marking the test in this manner, care should be taken so that the child is not able to perceive any scoring patterns, since such a perception may artifically inhibit or enhance his motivation during testing.

While administering and scoring the PPI, keep in mind a few simple guidelines. The PPI is not a speed test. Allow the child sufficient time to respond. If a child does not respond readily, encourage a response by repeating the question or saying "go ahead, what is the word?" or "go ahead, which picture is it?" whichever is applicable to the question. If there is still no response after a reasonable period of time, mark the item response as incorrect. Thus a lack of response or any response other than the correct one should be marked as incorrect.

Space is provided on each score sheet for comments as to observations made during the testing session. It is the purpose of this section to allow for subjective comments relevant to the child's performances on the test. Factors which may have had a detrimental influence on a child's performance should

be recorded as comments. Remarks on the behavior and attitude of the child should be noted to insure an adequate interpretation of the test score.

Instructions for Testing

Introduce the test by saying:

"I WANT TO PLAY A GAME WITH YOU. WE'RE GOING TO LOOK AT SOME PICTURES TOGETHER."

Open the test booklet to Section A, Example A, and say:

"HERE ARE SOME PICTURES. LOOK AT ALL OF THEM. (Point to all four pictures.) WHICH ONE IS THE DOG? POINT TO IT. POINT TO THE DOG."

After the response say:

"YES (NO). THIS IS THE DOG. LET'S TRY ANOTHER ONE." Do not score response for dog.

Turn page to Item 1 and begin scoring. Say:

"WHERE IS THE PITCHER? POINT TO (SHOW ME) THE (1) PITCHER."

Turn page and continue as above using these words:

(2) fan
(3) bush
(4) weapon
(5) uniform
(6) accident
(7) caboose
(8) badge
(9) queen
(10) elf
(11) steeple
(12) telephone pole
(13) pail
(14) tusk
(15) anchor

When the page beginning Section B is reached, say:

"THAT WAS VERY GOOD! YOU ARE DOING VERY WELL. NOW LET'S TRY SOMETHING NEW. SOME OF THE NEXT PICTURES I SHOW YOU GO TOGETHER BECAUSE WE USE THEM TOGETHER."

Turn page to Example B and say:

"HERE IS A PICTURE OF A TOOTHBRUSH (point). LOOK AT ALL THESE OTHER PICTURES (point to other four pictures). WHICH ONE OF THESE DO WE USE WITH A TOOTHBRUSH?"

After a response say:

"YES (NO), WE USE TOOTHPASTE WITH A TOOTHBRUSH."

Turn the page to Item 16 and again begin scoring. Say:

"HERE IS A PICTURE OF A (16) NEEDLE. WHICH ONE OF THESE DO WE USE WITH A NEEDLE?"

Turn the page and continue as above, using these words:

(17) car
(18) flag
(19) oar
(20) lamp
(21) glass
(22) horse
(23) cup
(24) doorknob
(25) telephone
(26) pot

When the page beginning Section C is reached, say:

"NOW HERE IS SOMETHING A LITTLE DIFFERENT FOR US TO DO. I'M GOING TO SHOW YOU SOME PICTURES THAT ARE LIKE EACH OTHER IN SOME WAY."

Turn page to Example C and say:

"HERE IS A SHOE AND A SLIPPER (point). THEY ARE LIKE EACH OTHER BECAUSE WE WEAR THEM ON OUR FEET. SHOW ME SOMETHING ELSE LIKE A SHOE AND A SLIPPER."

After response say:

"YES (NO) A SHOE AND A SLIPPER AND A BOOT ALL GO TOGETHER."

Turn page to Item 27 and again begin scoring. Say:

"HERE IS A (27) PEN AND A PENCIL (point). THEY ARE ALIKE IN SOME WAY. LOOK AT ALL THESE PICTURES (point). WHICH ONE OF THESE PICTURES IS MOST LIKE BOTH A PEN AND PENCIL?"

Turn page and continue as above with these pairs of words:

(28) man, woman
(29) horse, cow
(30) car, boat
(31) cap, hat
(32) coat, scarf
(33) foot, paw
(34) candle, flashlight
(35) river, puddle
(36) ball, wheel

When the page beginning Section D is reached, say:

"NOW I WANT YOU TO POINT TO SOME THINGS FOR ME."

Turn the page to Items 37-38-39 and say:

(37) "SHOW ME THE SET OF FOUR COOKIES."
(38) "NOW SHOW ME THE SET OF FIVE COOKIES."
(39) "NOW SHOW ME THE SET OF SIX COOKIES."

Turn the page to Items 40-41-42-43 and say:

(40) "NOW POINT TO THE NUMBER 3."
(41) "NOW POINT TO THE NUMBER 8."
(42) "NOW POINT TO THE NUMBER 2."
(43) "NOW POINT TO THE NUMBER 5."

Close the test booklet and say:

"THAT WAS VERY GOOD. NOW CAN YOU LISTEN VERY HARD TO WHAT I SAY? GOOD. BECAUSE I'M GOING TO SAY A SENTENCE AND LEAVE OUT A WORD. YOU TELL ME WHAT I LEAVE OUT. LISTEN! AN ELEPHANT IS BIG, A MOUSE IS _____. WHAT IS THE WORD I NEED? (repeat) AN ELEPHANT IS BIG, A MOUSE IS _____. (Pause) YES, (NO) AN ELEPHANT IS BIG, A MOUSE IS SMALL (or LITTLE). LET'S TRY ANOTHER ONE. LISTEN NOW. . ."

Begin scoring again for the following items. Say:

(44) "CATS HAVE KITTENS, DOGS HAVE _____ (PUPS OR PUPPIES)."
(45) "WE CRY WHEN WE'RE SAD, WE LAUGH WHEN WE'RE _____ (HAPPY)."
(46) "WE DRIVE IN A CAR, WE SAIL IN A _____ (BOAT, SHIP)."
(47) "APPLES ARE RED, LEMONS ARE _____ (YELLOW)."
(48) "WHEN WE RUN WE GO FAST, WHEN WE WALK WE GO _____ (SLOW, SLOWLY)."
(49) "IN THE DAY THERE IS THE SUN, AT NIGHT THERE IS THE _____ (MOON)."
(50) "IT'S HOT IN THE SUMMER, IT'S COLD IN THE _____ (WINTER)."
(51) "ABOVE US IS THE SKY, BELOW US IS THE _____ (GROUND, EARTH)."
(52) "FISH SWIM, BIRDS _____ (FLY)."
(53) "WE HAVE TOES ON OUR FEET, AND FINGERS ON OUR _____ (HANDS)."
(54) "MOMMY IS A WOMAN, DADDY IS A _____ (MAN)."

At the end of this section, say:

"GOOD BOY (GIRL)! NOW I WANT YOU TO SHOW ME SOME THINGS ABOUT YOU. WHERE IS YOUR NOSE? POINT TO IT. GOOD! NOW WHERE IS YOUR":

Begin scoring again and continue using these words:

(55) heart
(56) fingernail
(57) heel
(58) waist
(59) forehead
(60) wrist
(61) ankle

"YOU DID VERY WELL. THANK YOU VERY MUCH. I HOPE YOU HAD FUN PLAYING THIS GAME."

End test session and return the child to his classroom.

PENNSYLVANIA PRESCHOOL INVENTORY
RESPONSE FORM

(K E Y)

Child's Name _____ Test Date _____
Birth Date _____ Sex _____ Age (in months) _____
School/District _____
Dominant Language _____ Class/Teacher _____
Previous Tests Taken _____
Test Administrator _____
Score each item + or - and record responses. Total Score _____
Place any Comments or Observations on back of this sheet.

A Passive Vocabulary			B Complementary Relationships			C Non-Complementary Relationships		
	Score	Response		Score	Response		Score	Response
(01)	___	A (pitcher)	(16)	___	B (thread)	(27)	___	A (crayon)
(02)	___	B (fan)	(17)	___	D (road)	(28)	___	C (child)
(03)	___	C (bush)	(18)	___	D (flagpole)	(29)	___	D (pig)
(04)	___	C (weapon)	(19)	___	A (boat)	(30)	___	B (airplane)
(05)	___	A (uniform)	(20)	___	D (outlet)	(31)	___	D (bonnet)
(06)	___	D (accident)	(21)	___	D (pitcher)	(32)	___	D (mitten)
(07)	___	C (caboose)	(22)	___	B (saddle)	(33)	___	B (claw)
(08)	___	C (badge)	(23)	___	A (saucer)	(34)	___	C (lamp)
(09)	___	A (queen)	(24)	___	D (door)	(35)	___	C (raindrops)
(10)	___	B (elf)	(25)	___	D (telephone pole)	(36)	___	B (apple)
(11)	___	C (steeple)	(26)	___	C (stove)			
(12)	___	B (telephone pole)						
(13)	___	D (pail)						
(14)	___	B (tusk)						
(15)	___	D (anchor)						

D Number Concepts			E Verbal Analogies			F Awareness of Self		
	Score	Response		Score	Response		Score	Response
(37)	___	4	(44)	___	puppies (pups)	(55)	___	heart
(38)	___	5	(45)	___	happy	(56)	___	fingernail
(39)	___	6	(46)	___	boat (ship)	(57)	___	heel
(40)	___	3	(47)	___	yellow	(58)	___	waist
(41)	___	8	(48)	___	slow (slowly)	(59)	___	forehead
(42)	___	2	(49)	___	moon	(60)	___	wrist
(43)	___	5	(50)	___	winter	(61)	___	ankle
			(51)	___	ground (earth)			
			(52)	___	fly			
			(53)	___	hands			
			(54)	___	man			

1973, P. A. Dusewicz: Pennsylvania State Department of Education, Harrisburg, PA

Scoring and Interpreting Results

Summing all of a child's correct responses on the PPI yields his or her total raw score. Raw scores themselves can be used as a comparative guide among children, especially to rank them according to cognitive development.

By using Table II and Table III (See TABLES section of this manual), raw scores on the PPI can be converted to percentile rank scores or to normal curve equivalents, respectively. One great advantage of percentile scores is that they are the most easily understood of the more common forms of derived scores for persons with limited knowledge of testing theory and statistics. To obtain the percentile score for a particular raw score, first calculate the child's chronological age at the time of testing to the nearest whole month. Next, using Table II, find the appropriate age interval column for the child and follow it downwards until the row corresponding to his or her raw score is reached. At this point the percentile score, rounded off to the nearest whole number, can be found. At the upper and lower extremes of the scale, where no percentile scores appear in the table for possible raw scores, the actual percentile scores are greater than 99.5% or less than 0.5%. Each percentile score indicates the proportion of scores falling below a given raw score in the standardization sample. For example, consider the case of a 61 month-old child who achieves a raw score of 48, with a corresponding percentile score of 70. This means that within his or her age group (60-62 months) the child's score of 48 equalled or surpassed the scores of 70 per cent of the child's age peers on the PPI.

There are, however, important limitations in reporting and interpreting percentile scores. Specifically, because intervals between percentiles on the scale are not all the same size, such scores should not be used in arithmetic computations which may be necessary for complete and meaningful statistical

analysis. Use of normal curve equivalent scores, or NCE's, to report and analyze test data can eliminate this problem. Normal curve equivalents are generated by transforming raw scores to normalized standard scale scores. The NCE scale has a mean of 50 and a standard deviation of 21.06. Because the scale is normalized, one can assume the intervals between scores on the scale are equal; this means that NCE scores can be added, subtracted, multiplied, and divided with meaningful results. Also, scores on different test measures can be readily compared and aggregated when they are all converted to the common metric of the NCE.

Table III of this report shows normal curve equivalents for total raw scores on the Pennsylvania Preschool Inventory for the same age groups as the percentile score table. The NCE's are rounded off to the nearest tenth. At the highest and lowest extremes of the scale, where there are no NCE's listed corresponding to given raw scores, these values were either greater than 99.0 or less than 1.0, exceeding the practical limits of the scale.

Additional useful information of a diagnostic nature may be obtained from the Pennsylvania Preschool Inventory by scoring a child's number of correct responses on each of the six parts of the test separately (Passive Vocabulary, items 1-15; Complementary Relationships, items 16-26; Non-Complementary Relationships, items 27-36; Number Concepts, items 37-43; Verbal Analogies, items 44-54; and Awareness of Self, items 55-61). Then, the child's score on a particular section of the PPI can be compared to his scores on other sections and to the average score of his age peers in the norming sample by referring to Table I of this report. For example, in Table I, in the 60-62 month age group, the average score for items 37-43, Number Concepts was 4.77. If a 61 month-old child responded correctly to only one of the items, a weakness in recognizing numbers of objects in a set and in identifying numerals may exist, and the

child should be involved in activities which would strengthen these and other math-related skills.

STANDARDIZATION AND TECHNICAL INFORMATION

Test Design

Actual development of the PPI began with a consideration of the characteristics of a test which would fulfill the identified needs for a short yet reliable standardized measure of the cognitive development of young children that is relatively easy to administer, score, and interpret. The elements considered pivotal in the design of such a test and used as guidelines for test construction were: individual administration; a maximum of approximately 15 minutes testing time; a minimum of required technical knowledge for administration and scoring; resulting scores that are easily interpreted and which serve as relative indices of cognitive development.

The PPI was designed as an individual rather than a group test in order to strengthen its accuracy and reliability through the monitoring of the child's performance and reaction by the examiner. Any deviation noted through this individualized testing session can be noted and used later for prescriptive purposes, designative activities for the child to strengthen or expand specific cognitive areas. Furthermore, individual administration reduces the probability of error due to misunderstood directions. Although individual administration of a test is less time and cost efficient than group administration, the extremely young age range of the PPI's target population makes group testing a somewhat unreliable, if not impractical, method of administration.

The pre-established limit imposed on test length, during the instrument construction process, alleviates problems incurred by longer tests in taxing the child's attention span. The typical examiner using the PPI, most likely a

preschool teacher, is not called upon to muster the expertise of a testing specialist and should encounter little difficulty in understanding and administering the test, as well as in maintaining rapport with the child through the brief test period.

The PPI's test package and scoring system were designed to be as trouble-free as possible. No materials besides the test plate booklet and score sheet are needed to conduct a test session, reducing lengthy preparations and repeated manual reviews. This stress on minimization of needless sophistication encourages a larger pool of examiners, ranging from classroom teachers to school administrators.

A predominantly pictorial stimulus-psychomotor response set was chosen for the Pennsylvania Preschool Inventory as it was deemed the least verbally demanding of format possibilities. This is an important consideration in dealing with young children from varied backgrounds, who may feel threatened or confused by the testing situation.

Test Construction

The Pennsylvania Preschool Inventory emerged from a three-staged construction process: Stage I, survey of existing tests for review of possible item formats; Stage II, refinement of test item format and creation of pilot item pool; Stage III, test administration and item analysis.

Primary areas of investigation in the first stage of test development were reviewing the existent preschool test field and related literature, and choosing trial item formats for the PPI. Information gained from the test review process was carefully analyzed to develop the most efficient and valuable collection of item types, with regard to abilities measured, as well as testing efficiency.

Stage II, refinement of item types, eliminated less efficient and redundant item types and constructed some new item types specifically appropriate

for the PPI. The resultant fourteen general item types formed the pool from which the first pilot version of the test drew its components. Items constructed within the predetermined item type categories were converted into appropriate item formats for their administration. Finally, the initial pilot version of the test was compiled and reviewed for format difficulties before actual administration began.

Stage III of test development entailed field testing of the pilot forms of the PPI. Through successive rounds of testing the item pool was reduced in several stages, each round requiring shorter administration time. The result of this field testing was an item pool designated the PPI Research Form, a product of successive item analyses on test data obtained from more than 150 children enrolled in 10 nursery schools.

Standardization Procedure

In the summer of 1976, a number of Pennsylvania school districts were invited to participate in the standardization of the Pennsylvania Preschool Inventory. Each selected district received a letter requesting that Title I children between the ages of three and six enrolled in a regular fall program be administered the PPI at the onset of the school year. The school districts responded by returning an information sheet, indicating when the test instrument would be administered and approximately how many children and teachers would be involved. Test materials were sent to those school districts willing and able to participate. Upon completion of testing, the school districts were required to forward the test papers of their participating children to the Bureau of Research at West Chester State College. All completed test records from a total of 25 cooperating school districts across Pennsylvania were forwarded to the author for analysis.

Norms

Cooperating Pennsylvania school districts supplied 3,179 data records corresponding to Title I preschool and first grade children. The children were tested in the Fall of 1976 by classroom teachers, school psychological services staff, or Title I directors in their respective school districts. These children comprised the predominant portion of the normative sample. In order to increase sample size for the two youngest age groups, 33 scores from the administration of the PPI to Title I eligible children in a prekindergarten program in 1974 and 1975 were added, bringing the total norming sample to 3,212.

The children included in the norming sample ranged in age from 42 to 83 months. Most of them were enrolled in preschool, kindergarten, and first grade Title I programs in Pennsylvania school districts in the Fall of 1976.

For analysis and presentation of data, the total sample was divided into fourteen groups of age intervals, each spanning a three-month period. The intervals and corresponding numbers of children were:

42-44 months - 30 children
45-47 months - 61 children
48-50 months - 135 children
51-53 months - 130 children
54-56 months - 99 children
57-59 months - 162 children
60-62 months - 388 children
63-65 months - 488 children
66-68 months - 528 children
69-71 months - 461 children
72-74 months - 308 children
75-77 months - 189 children
79-81 months - 147 children
81-83 months - 86 children

Normative data presented in this report were empirically derived, and no attempt was made to smooth growth curves to adjust for small discrepancies across age groups. Because sample sizes in the two youngest age groups (42-44 months and 45-47 months) are rather low, and because these two groups represent

the results of tests administered during three different years, statistics and transformed scores provided for these two groups may not be as reliable as those for older groups. These facts should be kept in mind when examining the tables that follow, and especially when using transformed scores for individual reporting and evaluation purposes.

Correct responses were tabulated for both the total inventory and the six divisions of the test. Individual total scores ranged 55 raw score points, from a low of 6 to a high of 61. For each of the 14 age intervals, a group mean and standard deviation for the total test was calculated, as well as means and standard deviations for the six separate sections of the test. Results of these analyses appear in Table I. Generally speaking, the mean on any given section of the PPI increases steadily with age.

Percentile scores were calculated for raw scores within each age division, and are presented in Table II. Each entry in the table was rounded off to the nearest whole percentile. Table values were interpolated when a specific raw score did not actually occur within the sample. According to Table II, for a given raw score, as the age of the subjects increases, the corresponding percentiles decrease steadily in value. Subjects performed with increasing success in a rather steady progression from youngest to oldest age groups, although minor, generally insignificant exceptions to this growth pattern do occur.

To provide standardized scores, the percentile ranks were converted to normal curve equivalents or NCE's. The NCE scale consists of normalized standard scale scores which are equal-interval, having a mean of 50 and a standard deviation of 21.06. Use of equal-interval NCE scores facilitates arithmetic operations which are of questionable validity with other types of scales, such as percentiles. Table III whows NCE scores corresponding to raw scores on the PPI. These values were calculated by first assembling the percentile scores for the

norm sample, rounding each score to the nearest tenth, and finding the corresponding z scores in a statistical table of areas under the normal curve. The resultant z scores were then converted to NCE's using the following formula:

$$X_{NCE} = z\ (21.06) + 50$$

Reliability

In a preliminary study examining the results of administering the PPI to 85 nursery school children, a Kuder-Richardson 20 estimate of .93 was obtained (Benes and Dusewicz, 1975).

Measures of reliability for the PPI were provided by the Preliminary Standardization Analysis: Pennsylvania Preschool Inventory (Anttonen, 1976). In this earlier study, data provided from 13 school districts pretesting in the Fall of 1975 and posttesting in the Spring of 1976 provided the basis for the calculation of test-retest reliabilities. Due to wide variations among the districts in test dates and average age of children tested, test-retest correlation coefficients were calculated separately for each of the thirteen participating school districts. Table IV presents test-retest reliability coefficients, test dates, age ranges, mean ages, and numbers of children for the separate school districts. Reliability coefficients range from .62 to .90, occurring mainly in the .80's, comparing favorably with other tests of cognitive ability administered to young children.

The preliminary standardization study reported Kuder-Richardson 21 Reliability estimates for an expanded sample of 3,088 Title I children tested in the Fall of 1975. The estimates, calculated separately for each of four age categories, ranged from .85 to .87.

The Kuder-Richardson technique has also been used to obtain reliability coefficients for the 1976 norming sample. Results of calculating reliability

via Kuder-Richardson Formula 21 appear in Table V. Again, the coefficients occur mostly in the .80's, ranging from a low of .79 to a high of .92.

Validity

Initial validity studies were conducted on two groups of children enrolled in the Pennsylvania Research in Infant Development and Education Project. In 1972 and 1973, a sample of 20 preschool children and a sample of 65 children were administered the inventory as a part of a large battery of test measures (Benes and Dusewicz, 1975). For both groups, the same subjects were tested on the Stanford-Binet Intelligence Test, the Slosson Intelligence Test, and the Peabody Picture Vocabulary Test. The data were analyzed using Pearson product-moment correlations among PPI raw scores, Stanford-Binet mental ages, Slosson mental ages, and Peabody language mental ages. Correlations between the PPI and the Stanford-Binet Intelligence Test were .85 for the smaller sample and .90 for the larger. The correlation coefficient between the PPI and the Slosson Intelligence Test was .78 for the sample of 20, and .86 for the sample of 65. The PPI and Peabody Picture Vocabulary Test product-moment correlations were .68 for the smaller group and .91 for the larger group.

The Preliminary Standardization Analysis: Pennsylvania Preschool Inventory (Anttonen, 1976) provided validity information gathered from administration of the PPI in 31 Pennsylvania school districts in 1975. According to the report, correlation coefficients of the PPI and the Slosson Intelligence Test for three groups were .79, .70, and .53.

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TABLES

TABLE I MEANS AND STANDARD DEVIATIONS OF SIX SECTIONS

AND TOTAL SCORE ON THE PENNSYLVANIA PRESCHOOL INVENTORY

	Passive Vocabulary		Complementary Relationships		Non-Complementary Relationships		Number Concepts		Verbal Analogies		Awareness of Self		Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
42-44 months	6.97	3.02	5.17	2.46	4.23	2.39	1.93	1.95	4.43	3.07	3.20	1.99	25.93	12.37
45-47 months	6.67	2.33	4.43	2.20	3.95	1.67	2.08	1.78	4.98	2.97	3.90	1.31	26.01	8.13
48-50 months	7.43	2.78	4.64	2.37	3.93	1.99	2.45	1.71	6.23	2.19	4.69	.83	29.37	9.80
51-53 months	8.32	2.98	5.14	2.35	4.21	1.95	2.78	1.97	7.17	2.12	5.01	.98	32.62	9.78
54-56 months	8.56	2.78	5.31	2.20	4.55	1.89	3.11	1.71	6.85	2.20	4.99	.96	33.36	9.21
57-59 months	9.33	2.75	6.20	2.32	5.40	2.05	4.16	2.03	8.27	2.27	5.25	1.08	38.62	10.11
60-62 months	10.35	2.35	6.95	2.11	6.13	1.93	4.77	1.77	8.88	1.85	5.59	1.00	42.67	8.57
63-65 months	10.49	2.40	7.17	2.29	6.30	2.00	4.94	1.79	8.97	1.82	5.62	1.00	43.48	8.88
66-68 months	11.05	2.22	7.70	2.05	6.69	1.86	5.44	1.52	9.39	1.71	5.92	.93	46.17	8.01
69-71 months	11.30	2.25	8.03	2.00	6.80	1.91	5.62	1.40	9.47	1.67	6.01	.94	47.23	7.98
73-75 months	11.60	1.99	8.49	2.07	7.25	1.78	5.86	1.35	9.78	1.48	6.15	.94	49.14	7.42
76-78 months	11.89	2.07	8.73	1.91	7.32	1.85	5.92	1.21	9.97	1.35	6.14	.93	49.97	7.56
79-81 months	11.76	1.97	8.56	2.01	7.28	1.64	5.88	1.23	9.94	1.35	6.06	.95	49.49	7.08
81-83 months	12.07	2.08	8.81	2.02	7.23	1.66	6.10	1.22	9.97	1.37	6.01	.91	50.20	7.18

TABLE II - Pennsylvania Preschool Inventory - Percentiles for Raw Scores

Raw Score	42-44 months	45-47 months	48-50 months	51-53 months	54-56 months	57-59 months	60-62 months	63-65 months	66-68 months	69-71 months	72-74 months	75-77 months	78-80 months	81-83 months
61														99
60									99	99	99	99	99	97
59						99	99		98	98	97	97	98	94
58						99	99	99	97	96	94	93	95	89
57						98	98	98	95	93	89	88	91	84
56	98			99	99	98	96	96	91	90	84	82	84	81
55	98			98	99	96	94	93	89	87	77	74	76	74
54	98			97	98	95	92	90	85	81	71	67	69	66
53	97		99	96	98	93	90	85	80	75	66	62	62	56
52	97		98	95	97	91	86	80	74	70	59	56	54	50
51	96		97	94	96	88	81	76	68	65	52	50	49	46
50	96		96	93	95	85	77	73	62	59	48	45	44	41
49	95		94	92	95	83	74	70	58	54	44	40	38	37
48	94		94	91	94	80	70	65	54	48	38	34	34	33
47	93	99	93	90	92	77	66	61	48	41	32	30	30	28
46	93	99	91	87	88	73	61	55	43	37	26	25	28	24
45	92	99	91	87	87	69	57	51	39	33	22	22	25	22
44	88	98	90	86	85	65	52	48	34	29	19	20	22	17
43	87	98	90	85	83	61	48	43	31	25	17	17	18	13
42	87	97	89	82	81	58	44	38	28	21	15	15	14	11
41	86	96	87	79	78	56	41	35	25	19	13	13	11	10
40	85	96	84	78	75	54	36	32	21	17	11	11	10	9
39	82	92	82	77	72	50	32	29	18	15	9	9	9	8
38	78	91	81	74	67	47	29	26	16	13	8	8	7	7
37	77	90	79	72	63	45	25	23	14	11	7	7	6	6
36	75	89	77	68	61	42	23	21	12	9	6	6	6	5
35	74	88	74	65	59	39	20	19	10	8	5	5	5	5
34	73	84	71	62	58	35	17	16	8	7	5	4	4	4
33	73	79	68	58	54	31	15	14	6	5	4	4	3	3
32	72	75	65	53	49	26	13	11	6	4	3	3	2	3
31	71	71	61	49	45	23	11	10	5	4	3	2	2	2
30	69	70	59	45	41	20	9	9	4	3	2	2	2	2

TABLE II - Pennsylvania Preschool Inventory - Percentiles for Raw Scores (continued)

Raw Score	42-44 months	45-47 months	48-50 months	51-53 months	54-56 months	57-59 months	60-62 months	63-65 months	66-68 months	69-71 months	72-74 months	75-77 months	78-80 months	81-83 months
29	68	66	55	38	37	17	7	7	3	3	2	2	2	2
28	67	63	50	33	35	15	5	6	3	2	2	2	1	1
27	62	59	48	30	31	15	4	5	2	2	1	1	1	1
26	60	54	43	26	25	14	3	4	2	2	1	1	1	1
25	59	50	37	23	20	12	3	3	1	1	1	1	1	1
24	57	44	33	19	15	9	2	2	1	1	1	1		
23	52	39	29	16	12	8	1	2	1	1	1	1		
22	48	35	26	13	9	6	1	2	1	1	1	1		
21	40	32	22	9	7	4	1	1	1		1	1		
20	32	29	19	8	6	3	1	1	1		1	1		
19	27	23	14	5	4	2	1	1			1	1		
18	24	15	10	4	2	1		1						
17	22	12	9	3	2	1		1						
16	20	10	6	2	1	1								
15	18	7	3	2										
14	15	5	1	1										
13	13	3		1										
12	12	3		1										
11	10	2												
10	10	2												
9	8	2												
8	5	1												
7	3	1												
6	2	1												
5														
4														
3														
2														
1														
0														

TABLE III - Pennsylvania Preschool Inventory - Normal Curve Equivalents

Raw Score	42-44 months	45-47 months	48-50 months	51-53 months	54-56 months	57-59 months	60-62 months	63-65 months	66-68 months	69-71 months	72-74 months	75-77 months	78-80 months	81-83 months
61														
60											96.9	98.2		89.9
59									95.7	93.3	90.9	89.3	93.3	83.1
58							99.0		90.6	87.9	83.3	81.2	84.4	75.8
57						95.7	93.7	95.2	83.7	81.7	75.8	74.4	78.0	71.2
56	94.6					91.3	87.1	87.6	78.6	77.4	70.8	69.1	70.9	68.3
55	93.3			93.7		87.6	82.4	81.7	75.3	73.3	65.8	63.8	64.5	63.8
54	92.0			90.6	95.7	84.9	79.5	76.4	71.6	68.2	61.4	59.5	60.4	58.9
53	90.6		98.2	87.4	93.3	81.4	77.0	71.7	67.1	64.0	58.6	56.4	56.5	53.4
52	89.3		93.7	85.3	91.3	78.2	72.9	68.0	63.5	60.7	55.0	52.9	52.3	50.0
51	87.6		89.6	83.1	88.1	74.4	68.7	64.9	59.6	57.9	51.2	49.9	49.3	47.8
50	85.9		85.9	81.6	85.7	71.5	65.4	63.0	56.7	55.0	48.9	47.2	46.6	45.0
49	84.6		83.5	80.0	84.0	70.1	63.4	60.9	54.2	52.0	46.6	44.5	43.8	42.8
48	83.3		82.2	78.2	82.6	67.9	61.2	58.3	51.8	48.8	43.4	41.6	41.1	40.5
47	81.9		80.5	76.5	79.5	65.5	58.5	55.7	49.2	45.4	40.1	38.7	38.9	37.7
46	80.6	98.2	78.9	74.0	75.2	63.2	56.0	52.8	46.3	43.1	36.8	36.1	37.5	35.4
45	79.2	95.7	77.9	73.2	73.6	60.7	53.6	50.4	43.9	40.8	33.6	33.9	35.9	33.4
44	75.1	93.7	77.0	72.6	72.2	58.2	51.3	48.7	41.5	38.1	31.7	32.0	33.8	30.2
43	74.2	91.3	76.2	71.5	70.3	56.1	49.2	46.4	39.5	35.6	30.1	30.0	30.7	26.1
42	73.3	89.0	75.3	69.2	68.3	54.4	46.8	43.7	37.8	33.2	28.0	27.8	27.1	24.5
41	72.8	86.6	73.4	66.8	66.1	53.4	45.0	41.7	35.8	31.3	26.3	26.5	24.4	22.9
40	71.8	86.6	71.3	66.0	64.0	52.3	42.6	40.0	33.3	29.7	24.1	24.5	22.4	21.4
39	69.0	79.3	69.4	65.2	62.4	50.2	40.2	38.2	31.0	28.2	21.5	22.1	21.1	19.8
38	66.5	78.0	68.3	63.7	59.4	48.8	38.1	36.3	28.7	26.4	20.1	20.5	19.1	18.4
37	65.4	77.0	67.2	62.0	56.8	47.4	36.0	34.5	26.8	24.3	18.9	19.4	17.9	17.1
36	64.2	75.7	65.6	59.9	55.7	45.9	34.4	32.9	24.8	22.0	16.9	17.8	16.9	15.8
35	63.7	74.4	63.6	58.3	54.8	43.9	32.3	31.5	22.8	20.0	16.0	16.0	15.6	14.7
34	63.0	70.6	61.7	56.4	54.0	42.0	29.8	29.5	20.5	18.3	14.7	14.1	13.4	13.4
33	62.7	66.8	59.9	54.3	51.8	39.3	27.9	26.9	17.8	15.8	12.9	12.4	9.4	10.1
32	62.1	63.9	58.0	51.8	49.5	36.6	25.8	24.2	16.5	13.8	11.0	10.4	8.3	9.1
31	61.3	61.8	55.9	49.6	47.6	34.5	23.7	22.4	15.4	12.1	9.7	8.3	7.2	8.0
30	60.6	60.9	54.5	47.6	45.4	32.3	21.5	21.2	13.4	10.4	8.0	6.7	6.3	6.7

TABLE III - Pennsylvania Preschool Inventory - Normal Curve Equivalents (continued)

Raw Score	42-44 months	45-47 months	48-50 months	51-53 months	54-56 months	57-59 months	60-62 months	63-65 months	66-68 months	69-71 months	72-74 months	75-77 months	78-80 months	81-83 months
29	59.9	58.9	52.5	43.9	43.2	29.9	18.9	19.4	11.3	9.4	5.6	5.4	5.4	5.4
28	59.1	57.0	50.2	41.0	41.8	28.3	16.0	16.9	9.4	8.3	4.8	4.3	3.1	3.7
27	56.3	54.8	48.8	39.0	39.4	27.7	12.9	15.1	6.7	6.7	4.3	3.1	1.0	1.0
26	55.3	52.5	46.4	36.6	36.0	27.1	10.7	13.8	4.3	4.3	3.1	1.8		
25	54.6	50.0	43.2	34.2	32.0	24.9	9.1	11.3	3.7	3.1	1.8			
24	53.6	47.0	40.7	31.4	27.8	22.1	7.2	8.7	2.5	1.0				
23	50.9	44.3	38.5	29.2	24.8	20.8	3.7	7.6	1.0					
22	49.1	42.0	36.2	26.0	21.2	18.1	2.5	5.6						
21	44.7	40.1	33.7	22.0	18.3	13.8	1.0	2.5						
20	40.0	38.2	31.1	20.0	16.5	11.6								
19	36.9	34.4	27.3	15.4	11.9	8.7								
18	35.3	28.0	23.5	12.9	8.3	2.5								
17	33.5	25.1	21.1	10.4	4.8									
16	32.3	22.4	17.1	8.0	1.0									
15	31.0	19.5	9.1	5.6										
14	28.2	15.6	1.0	3.7										
13	26.7	11.3		1.0										
12	24.9	9.4												
11	23.5	8.0												
10	22.9	6.3												
9	20.8	4.3												
8	15.4	3.1												
7	10.1	1.0												
6	5.4													
5														
4														
3														
2														
0														

TABLE IV

DISTRICT TEST-RETEST RELIABILITY FOR PPI

District	Test-Retest Reliability	N
1.	.86	57
2.	.89	57
3.	.80	89
4.	.90	51
5.	.84	25
6.	.77	176
7.	.88	27
8.	.88	14
9.	.89	28
10.	.83	53
11.	.86	60
12.	.62	28
13.	.73	182

TABLE V

DER-RICHARDSON 21 RELIABILITIES FOR PPI NORMATIVE SAMPLE

Age	r_{xx}
42-44 months	.92
45-47 months	.79
48-50 months	.86
51-53 months	.86
54-56 months	.86
57-59 months	.88
60-62 months	.84
69-71 months	.85
72-74 months	.84
75-77 months	.86
78-80 months	.83
81-83 months	.84

The Pennsylvania Preschool Inventory

TEST PLATES

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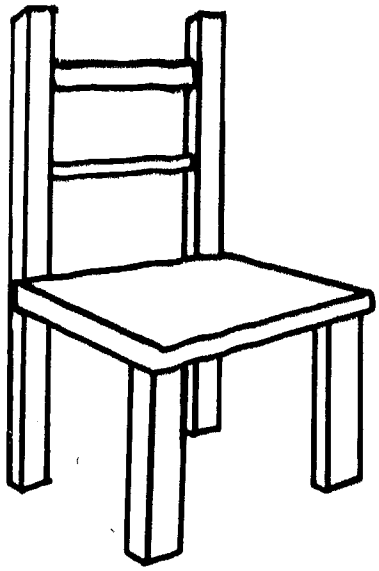
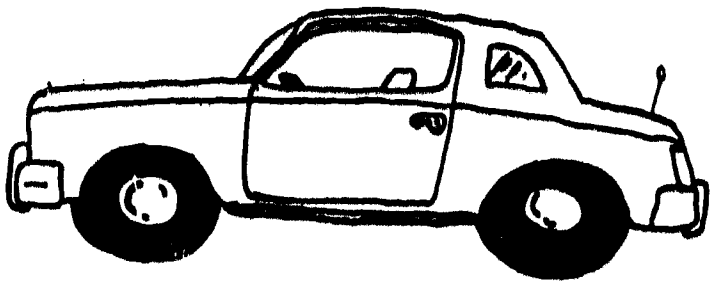
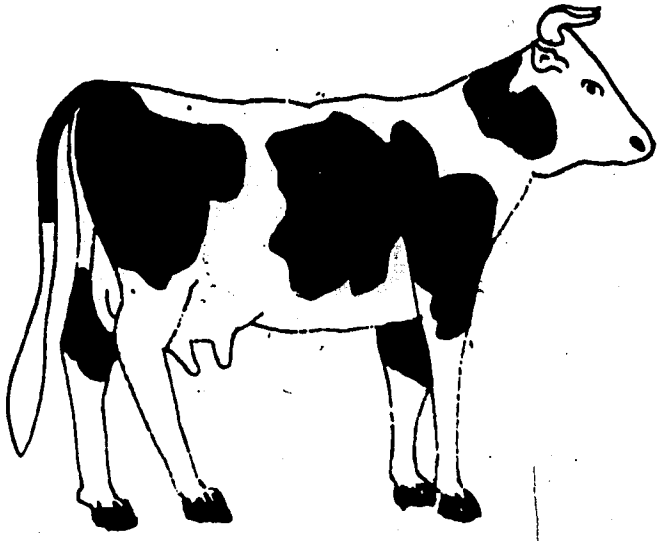
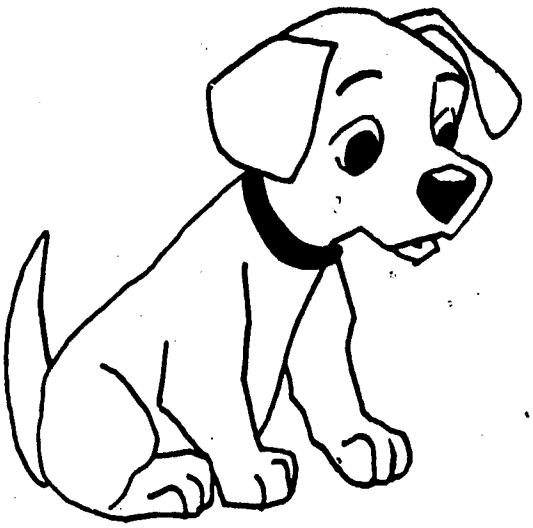
SECTION A

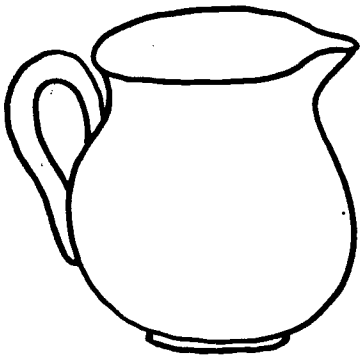
Example A

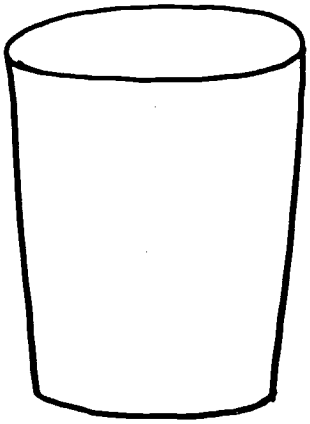






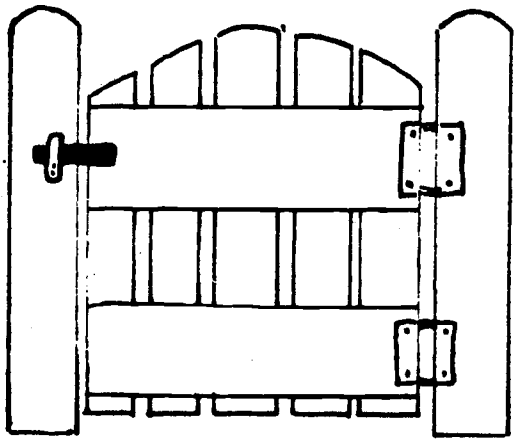


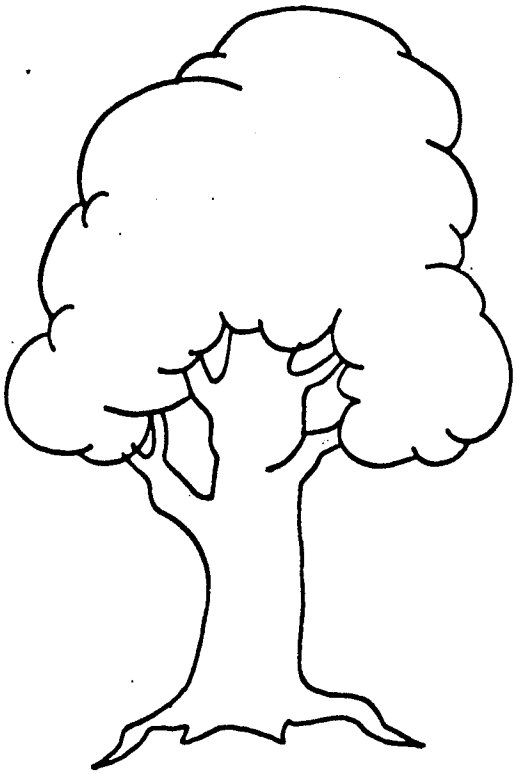


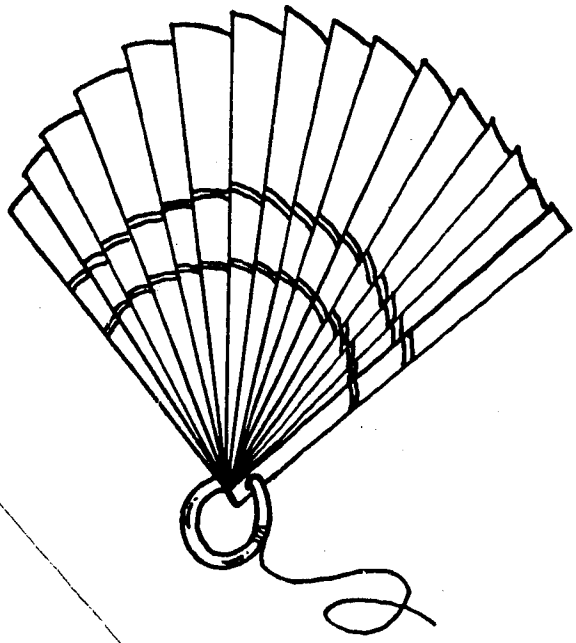


A B

C D

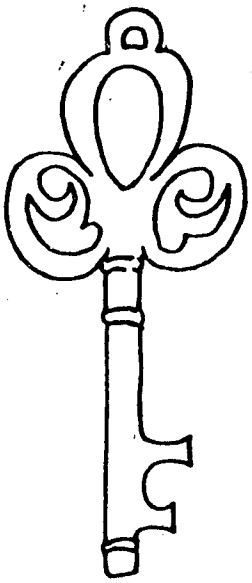


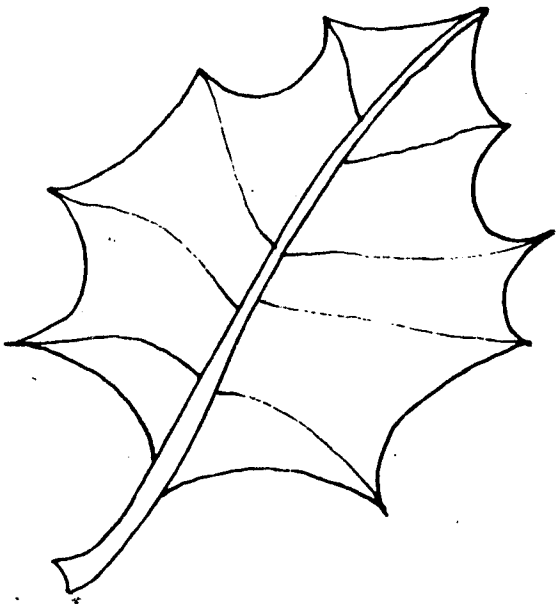


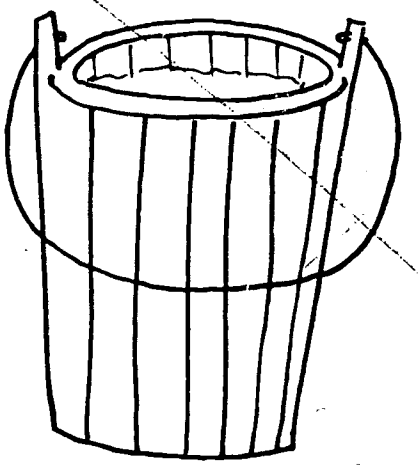


A B

C D

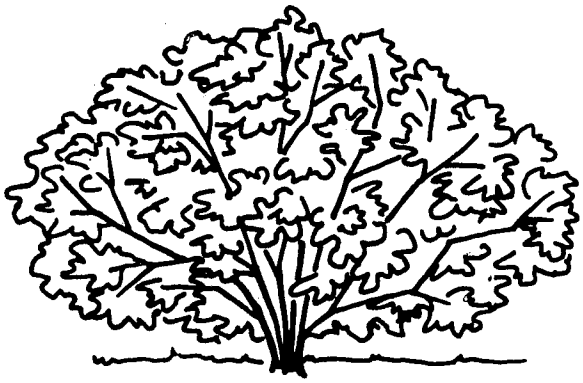


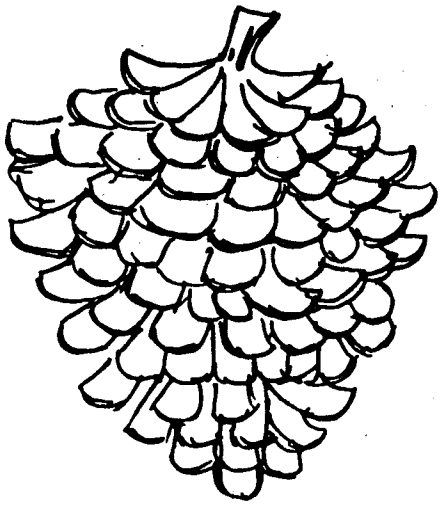


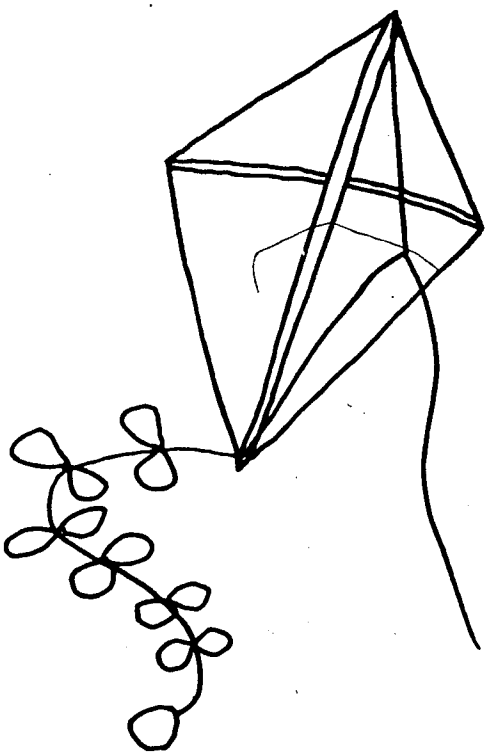


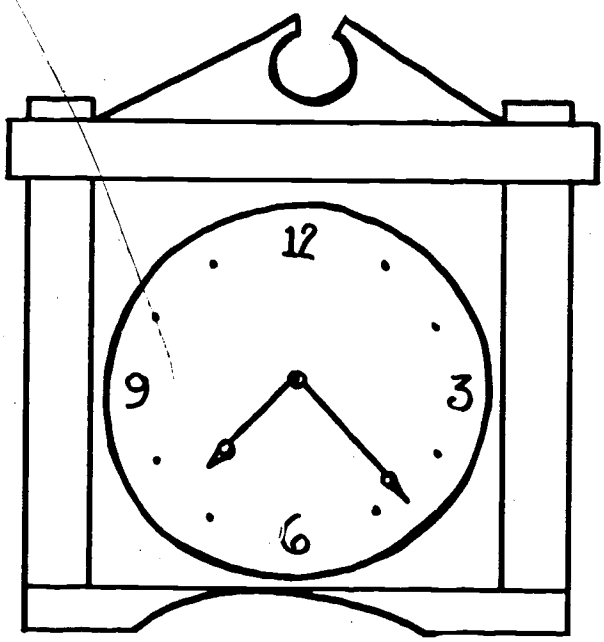
A B

C D



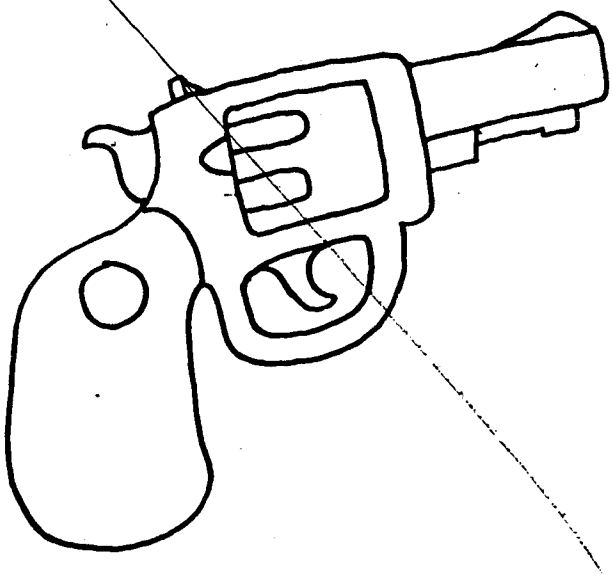


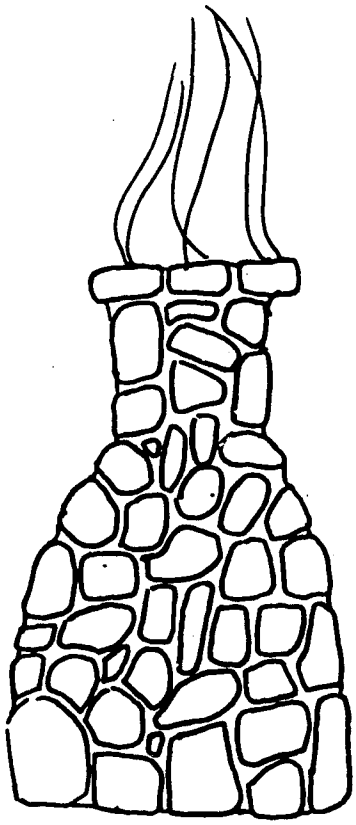


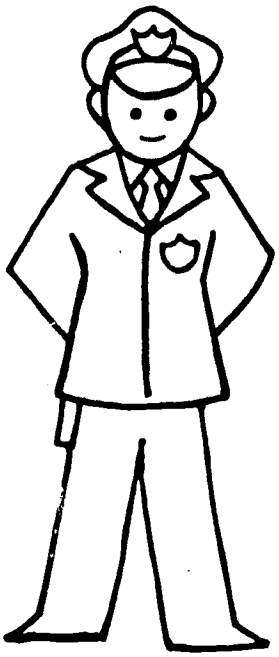


A B

C D

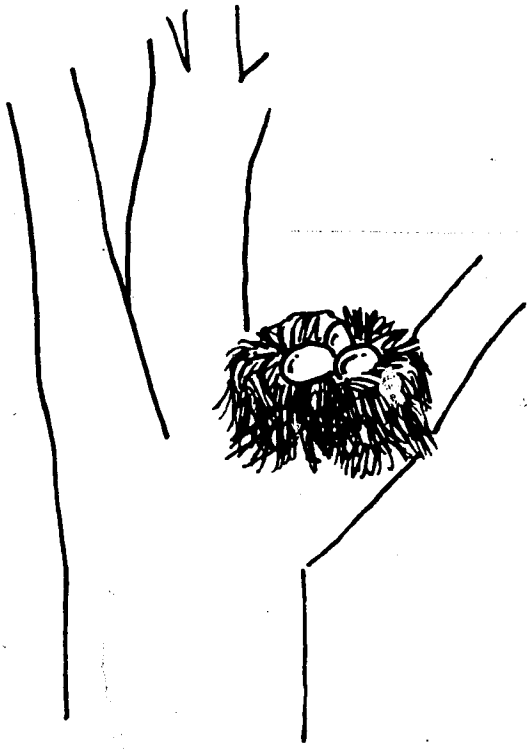


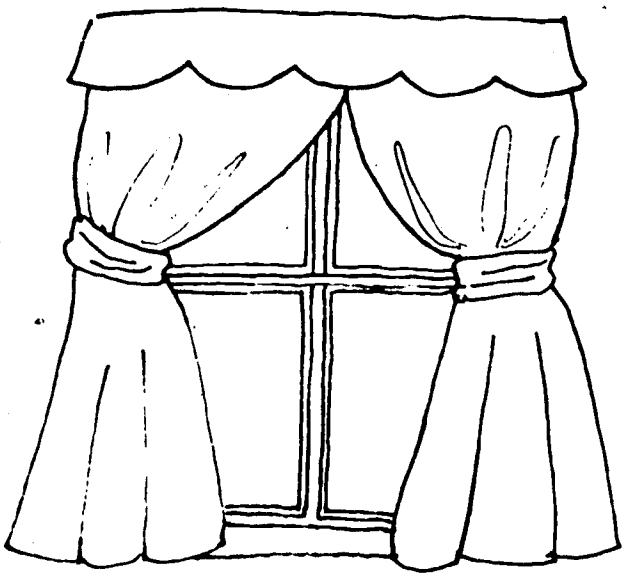


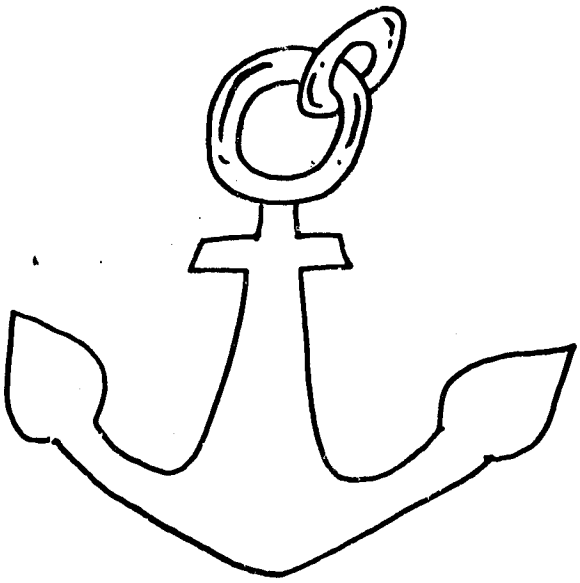


A B

C D







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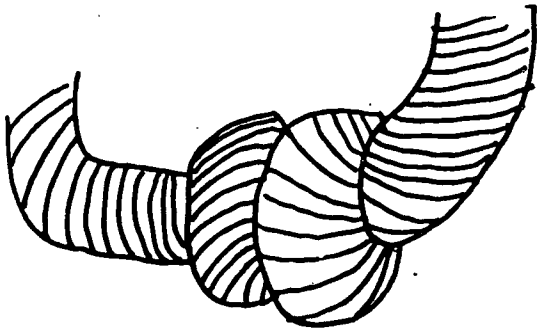

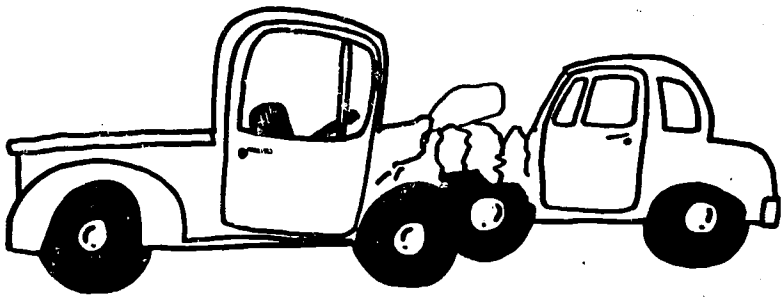

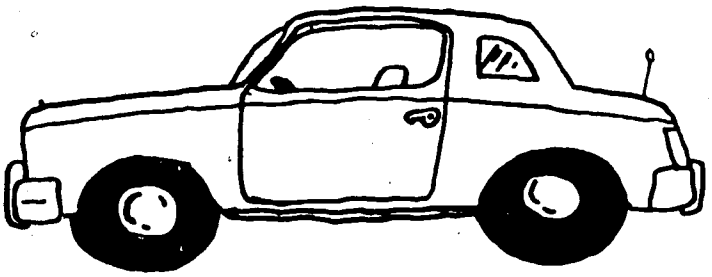

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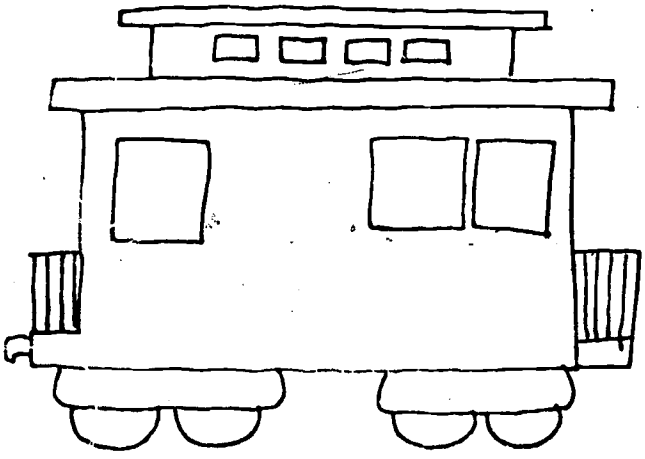

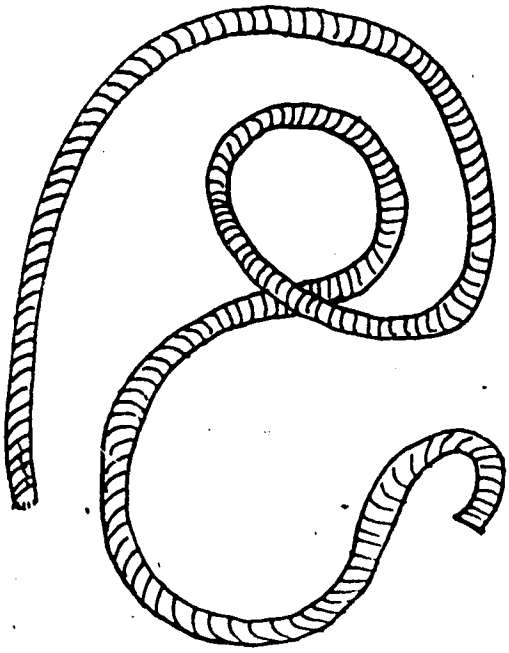

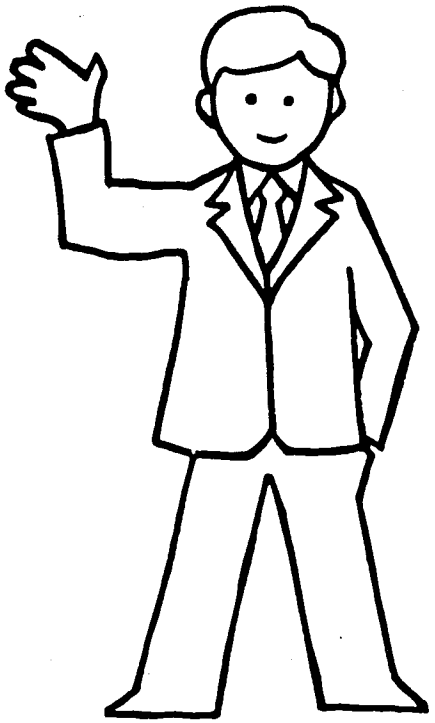

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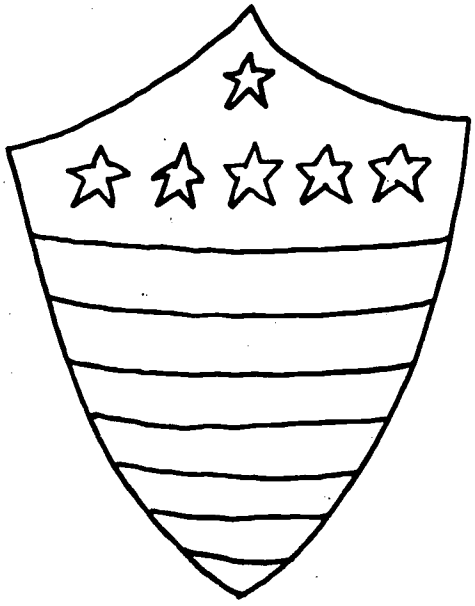

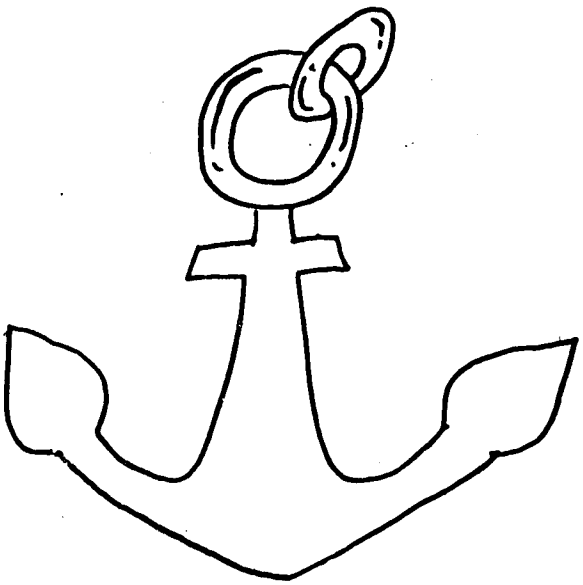

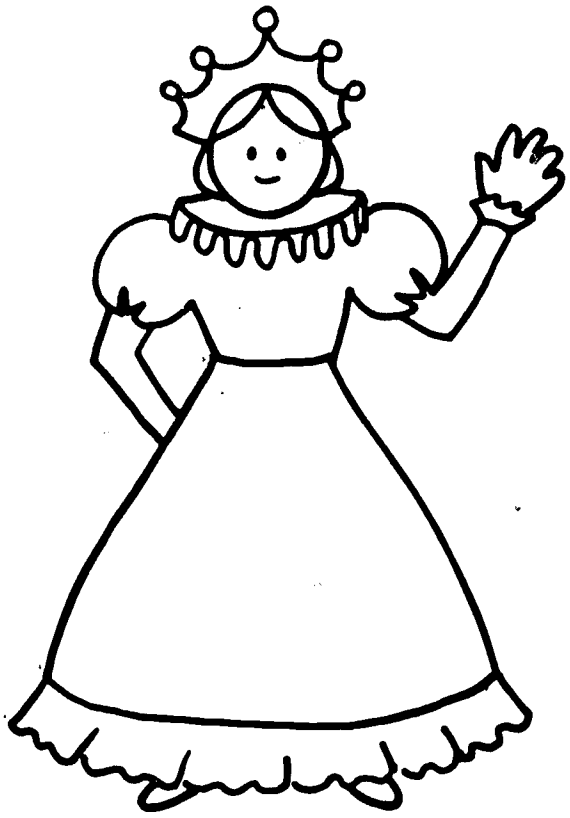

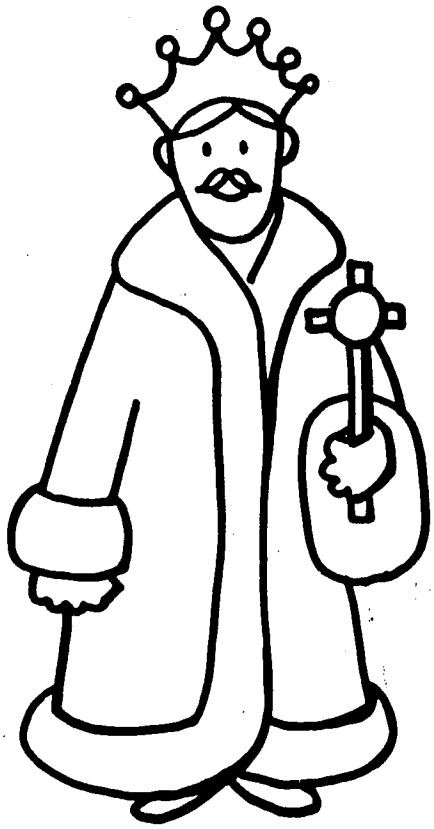

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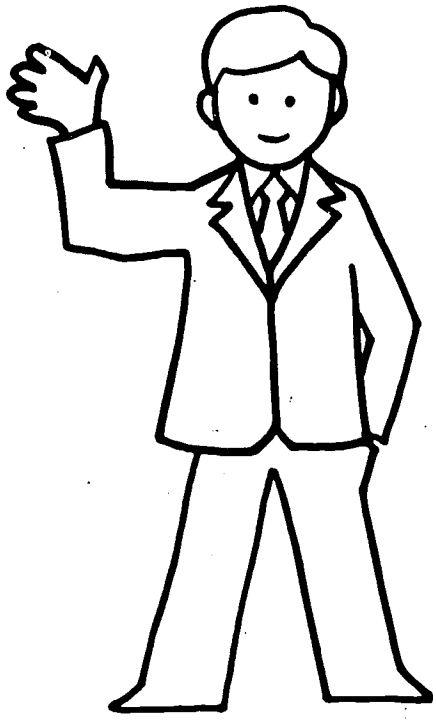

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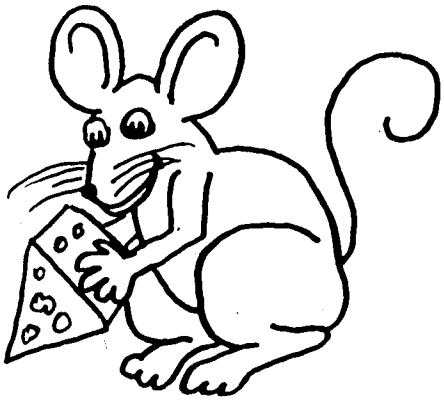

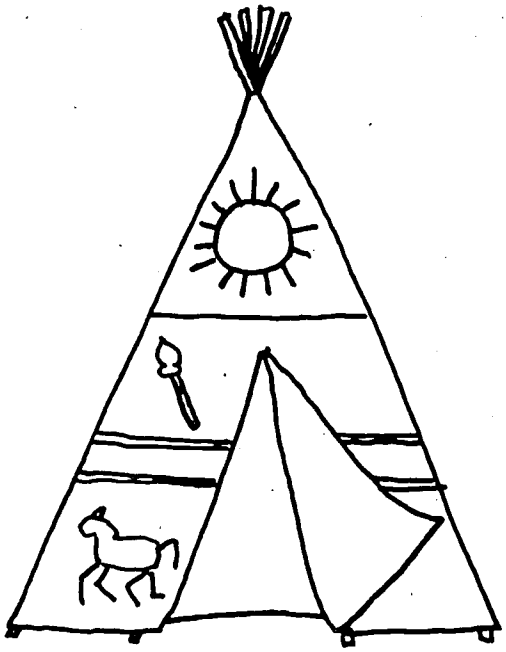

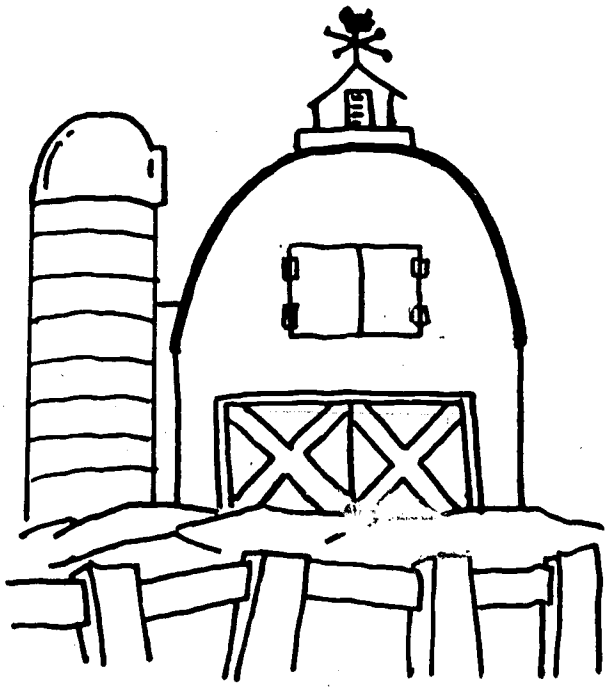

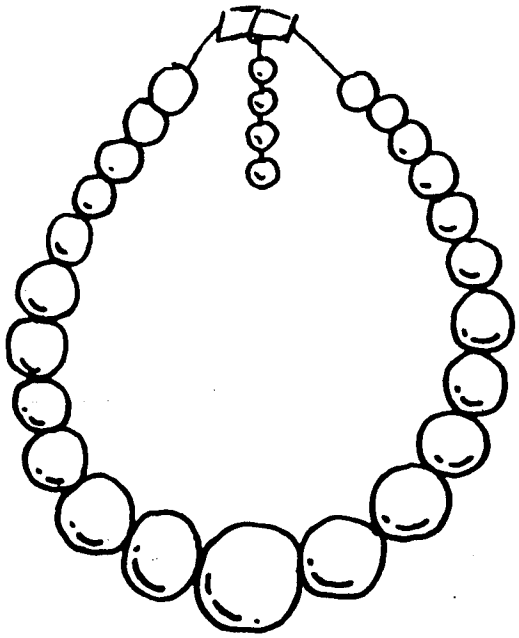

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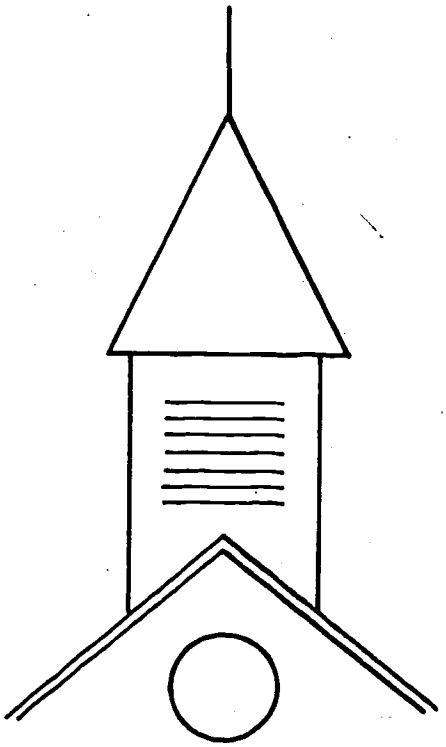

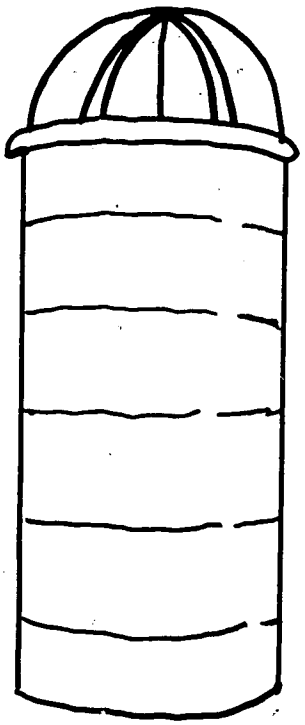

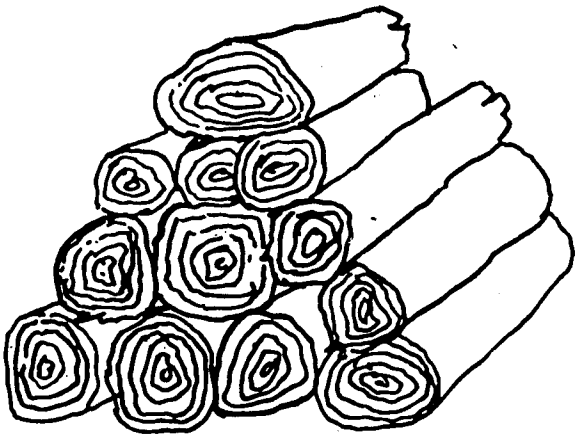

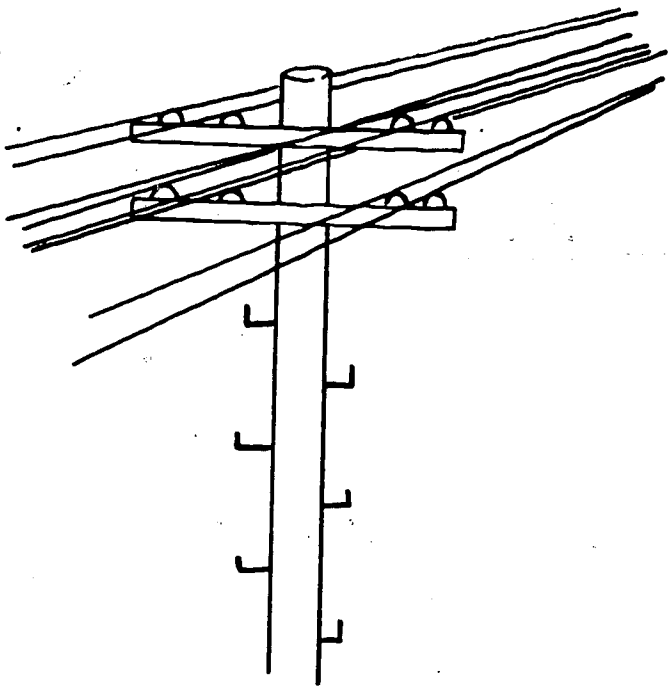

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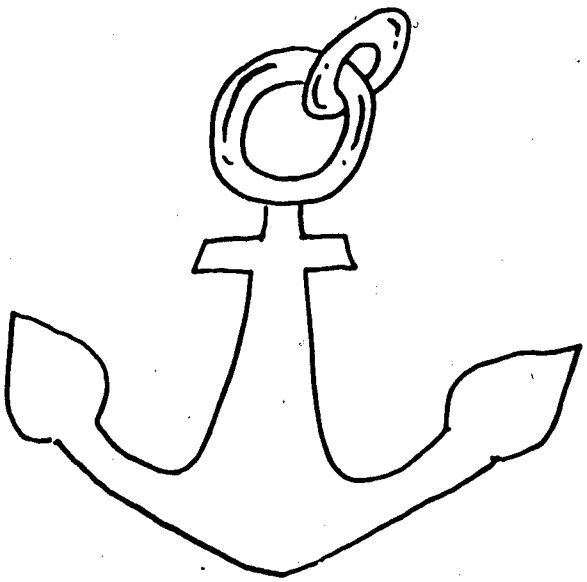

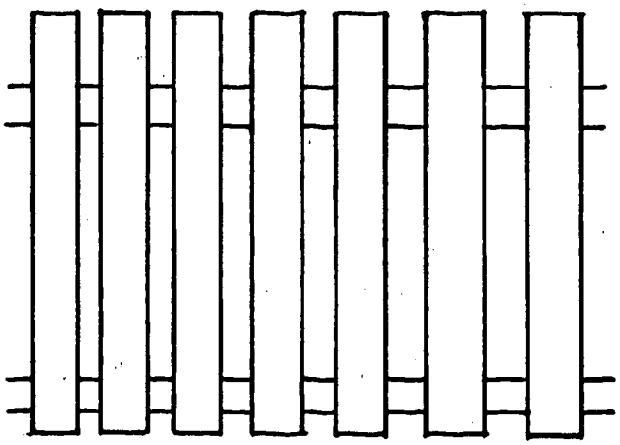

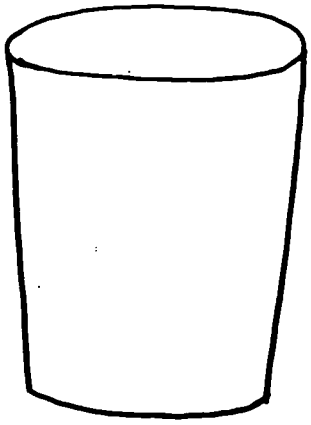

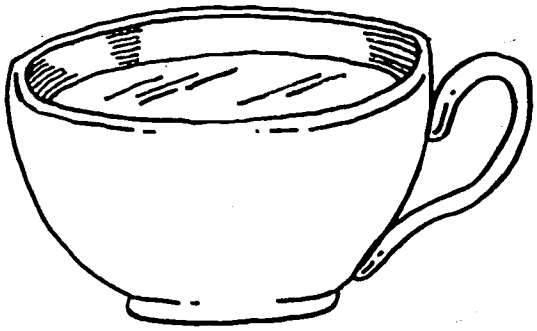

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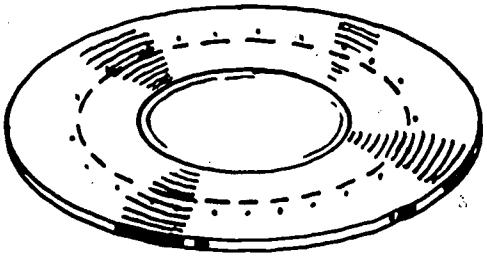

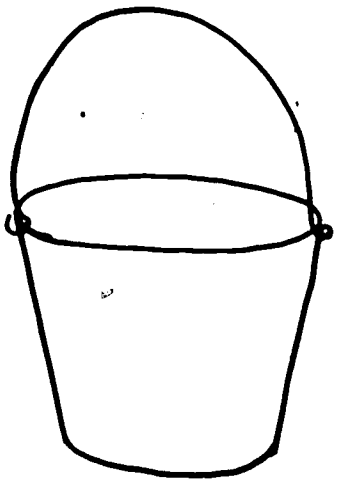

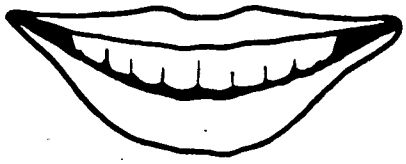

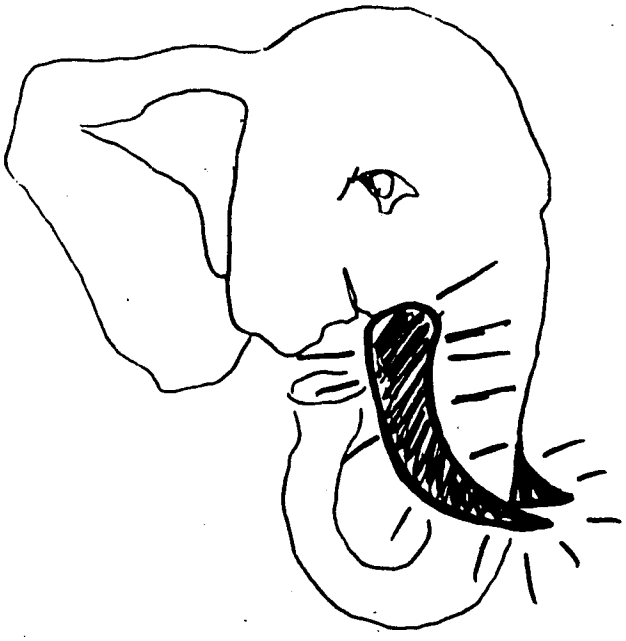

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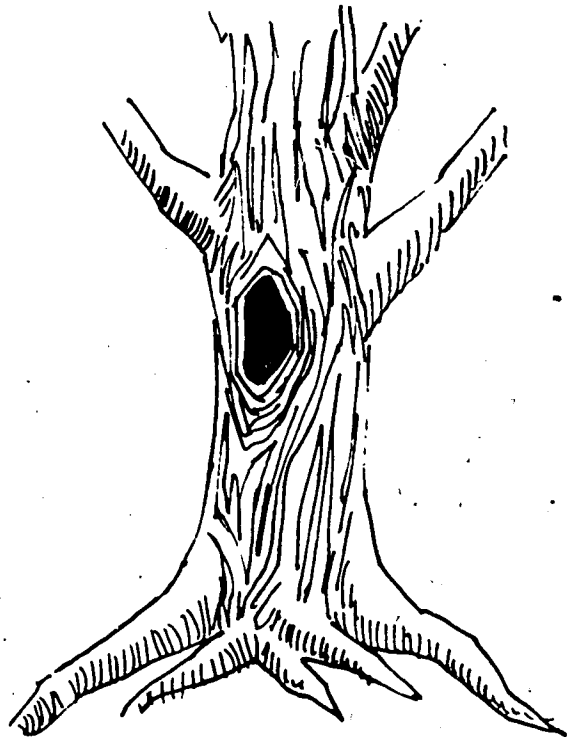

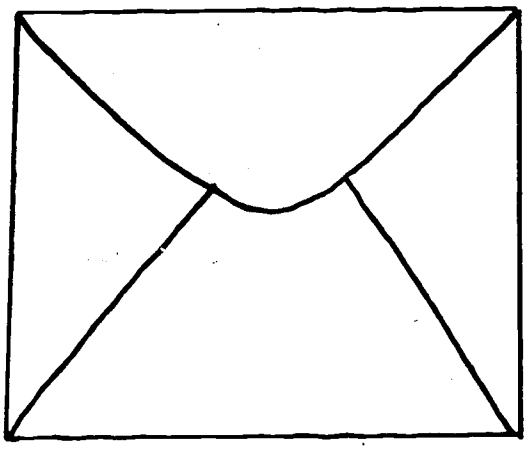

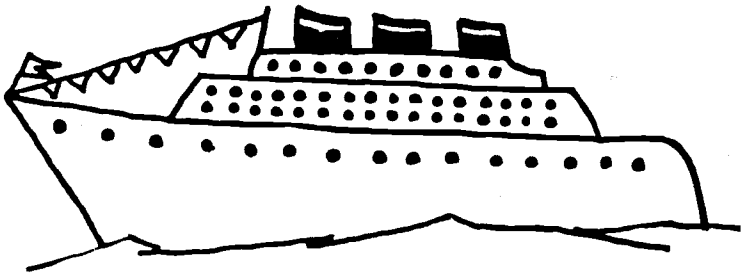

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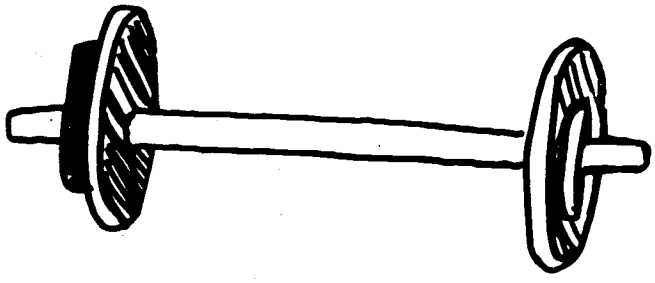
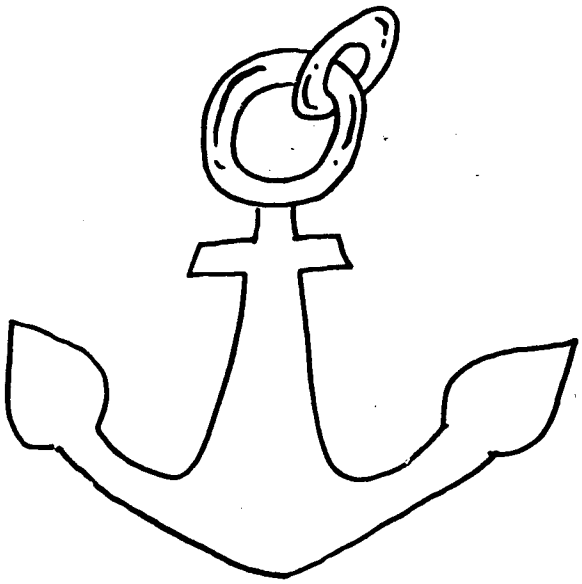
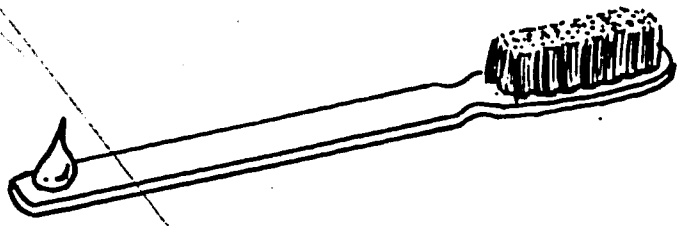
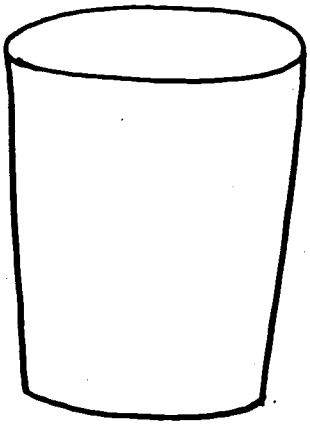


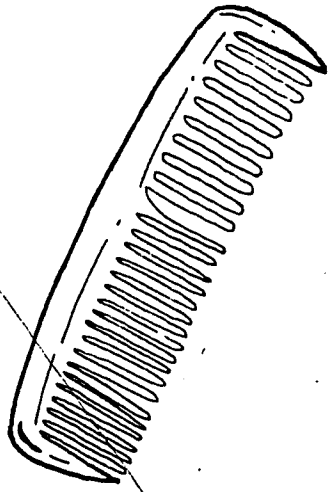


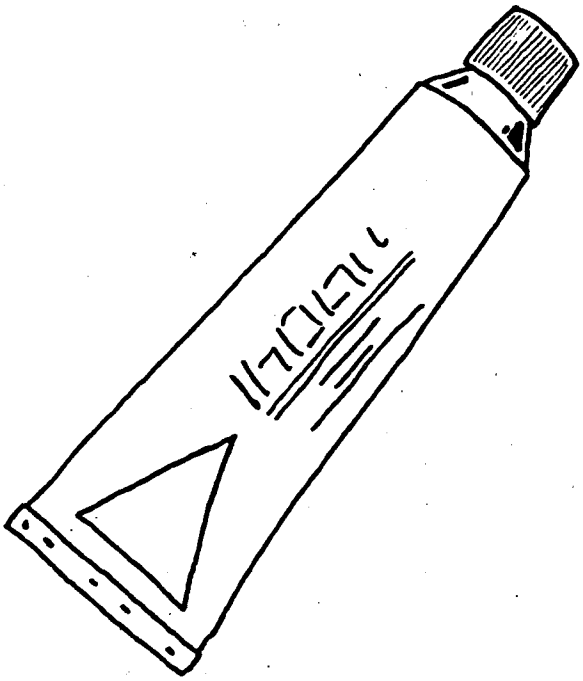
SECTION B

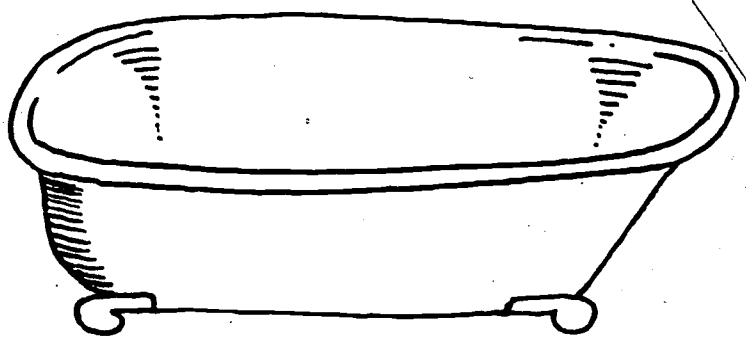
Example B

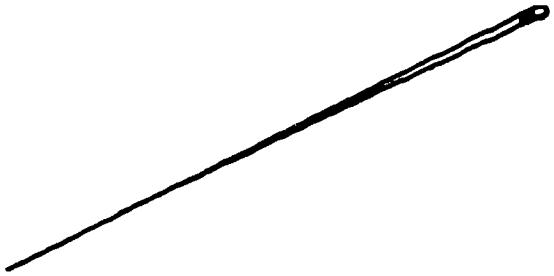


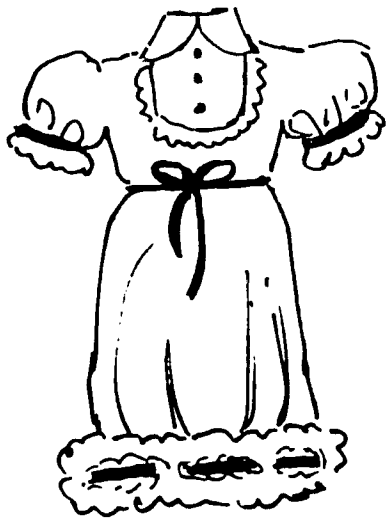












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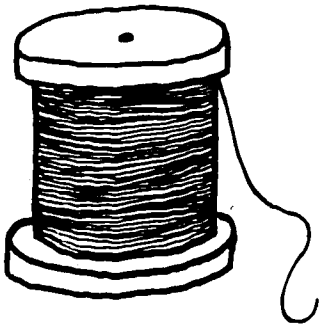

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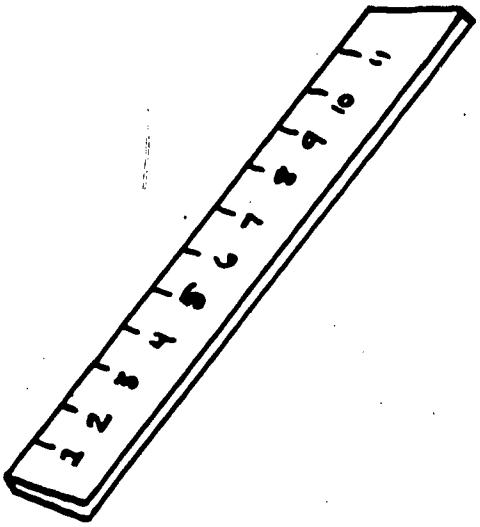

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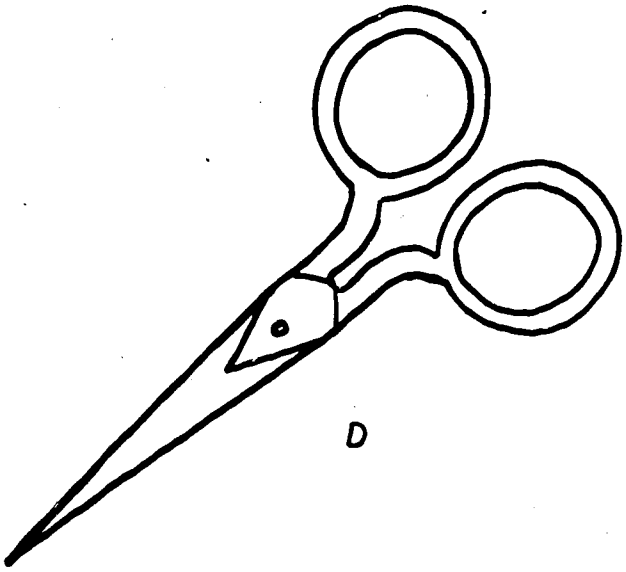

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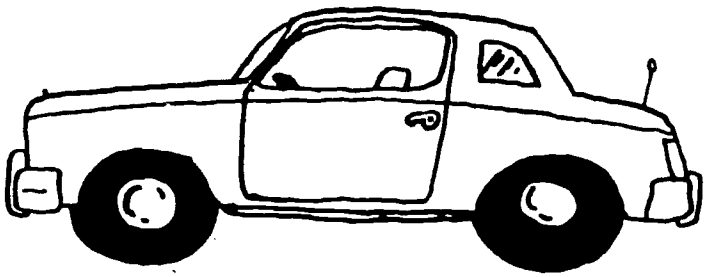

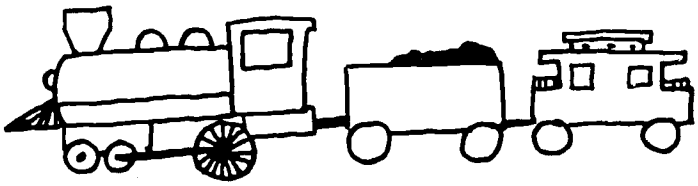

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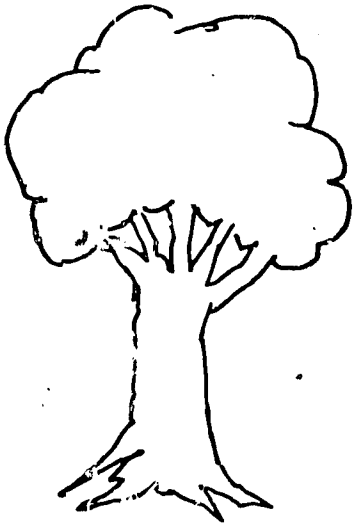

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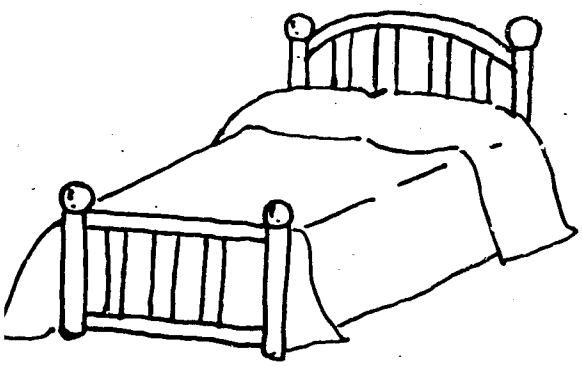

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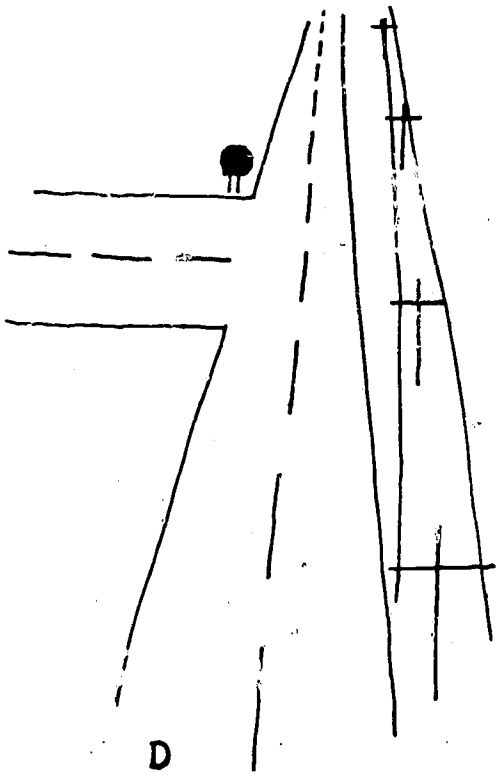

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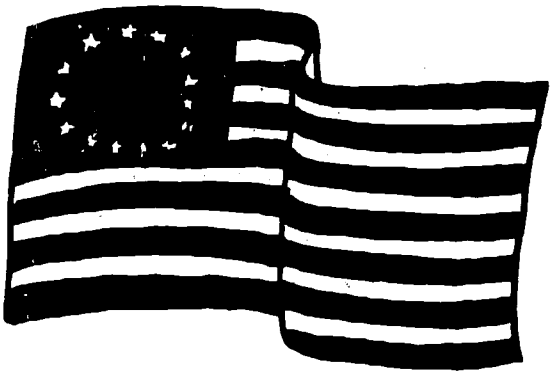

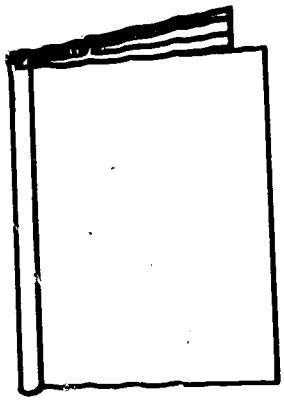

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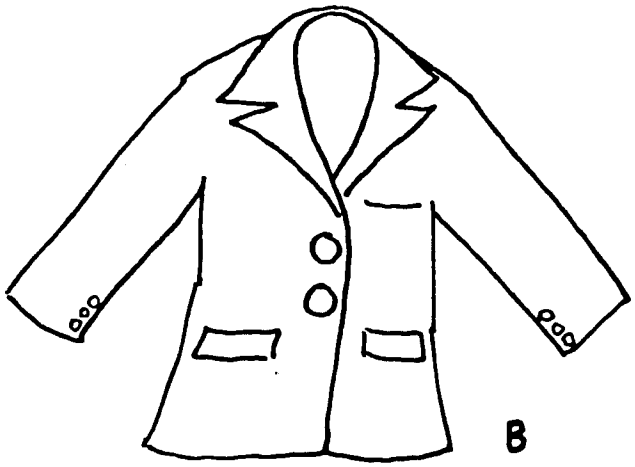

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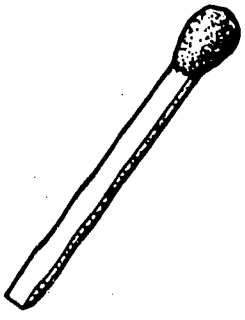

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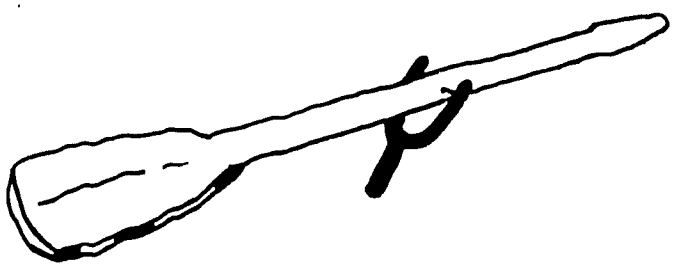

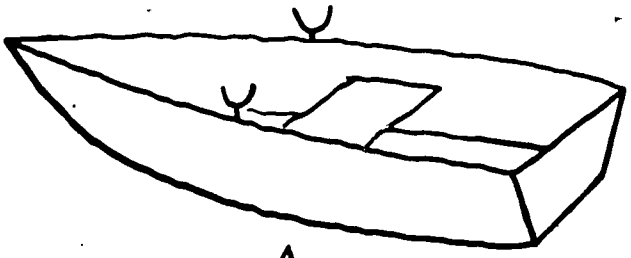

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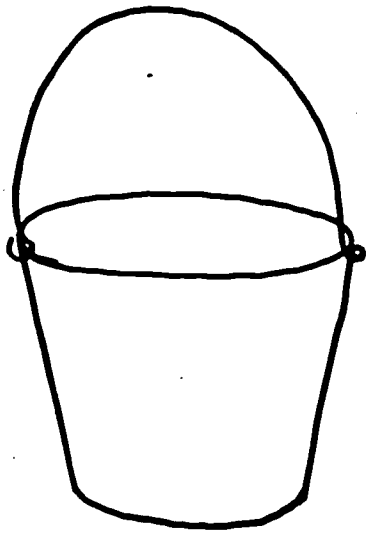

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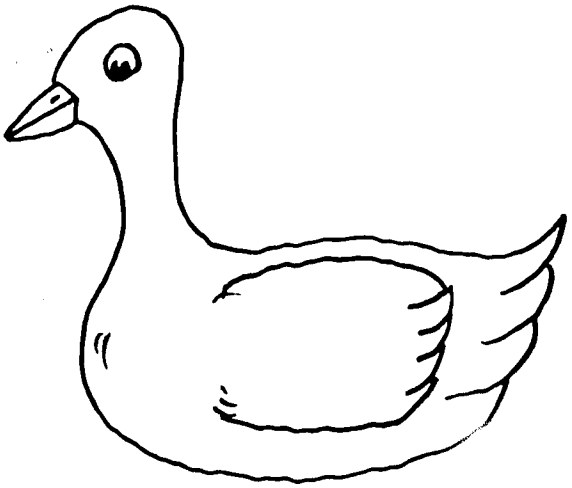

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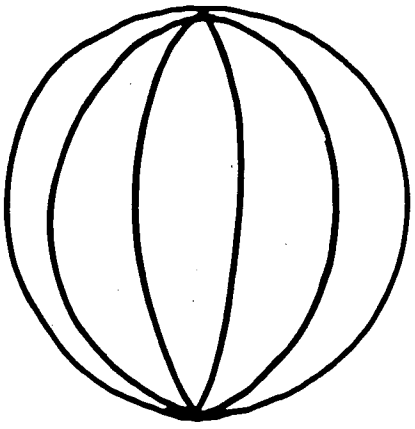

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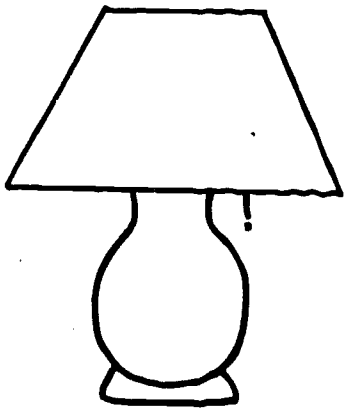

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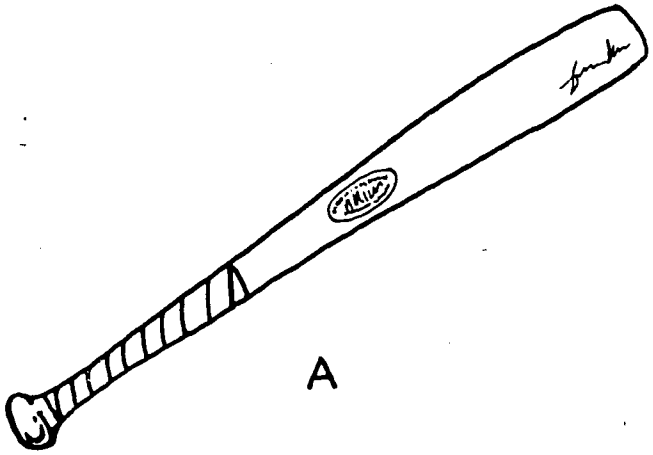

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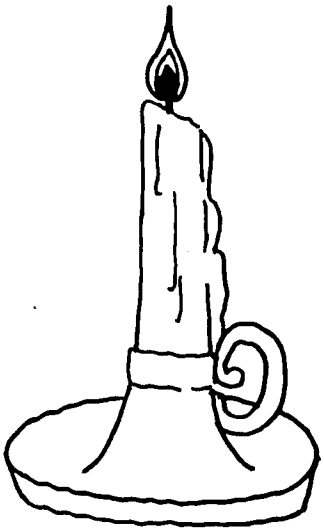

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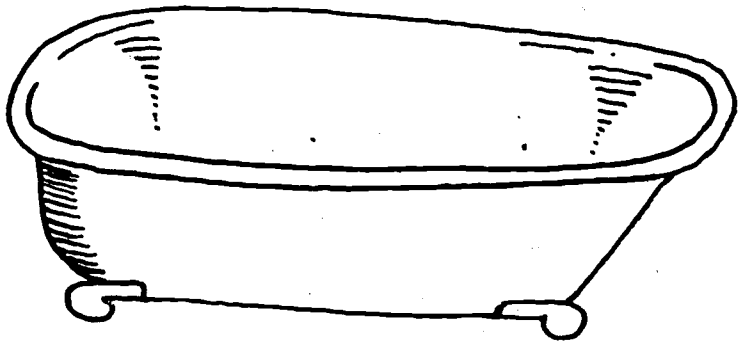

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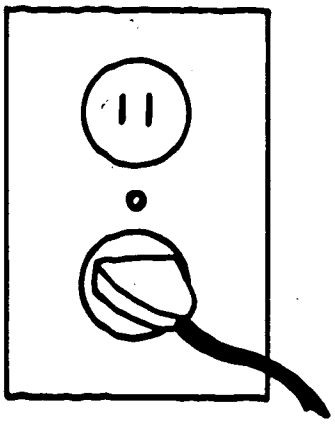

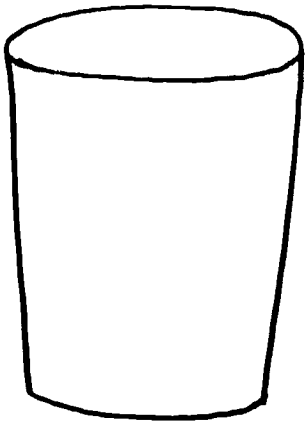

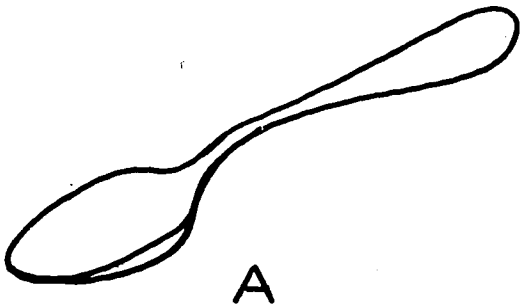

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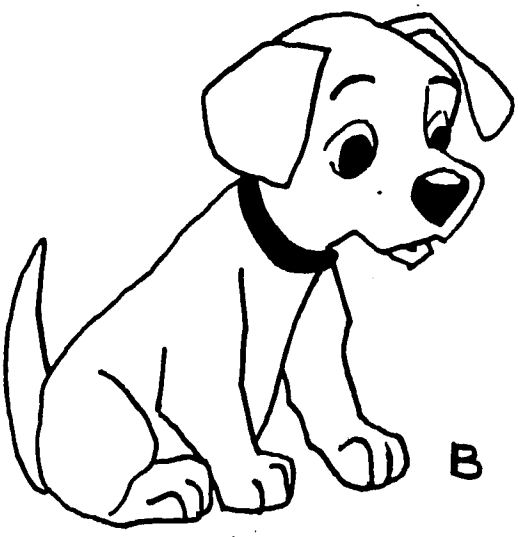

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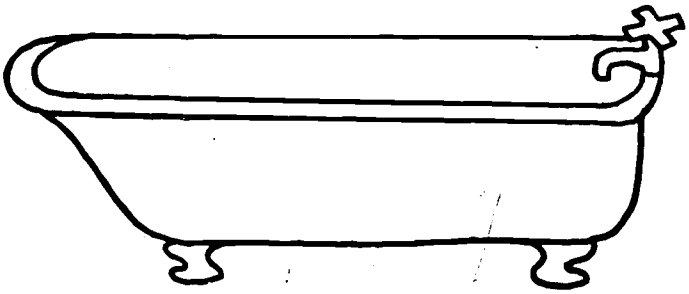

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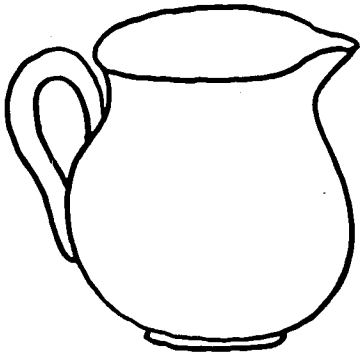

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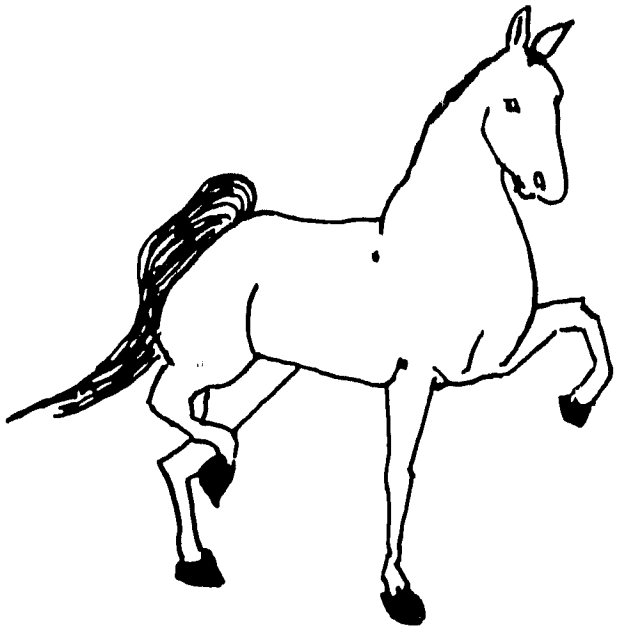

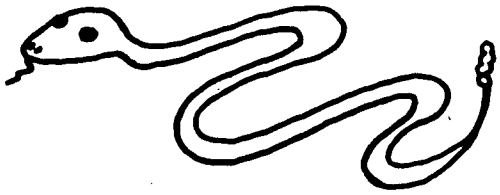

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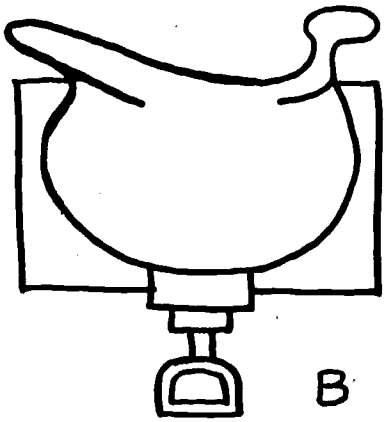

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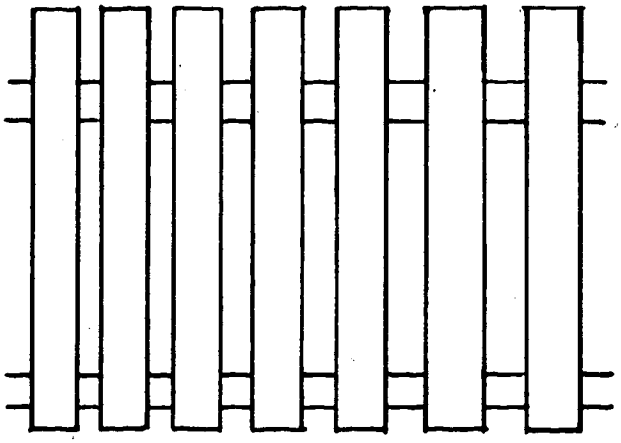

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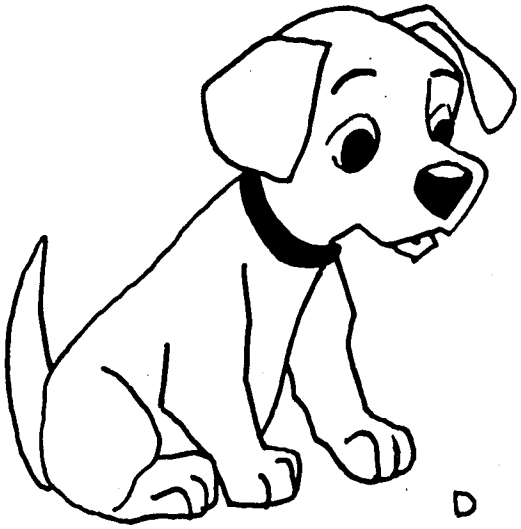

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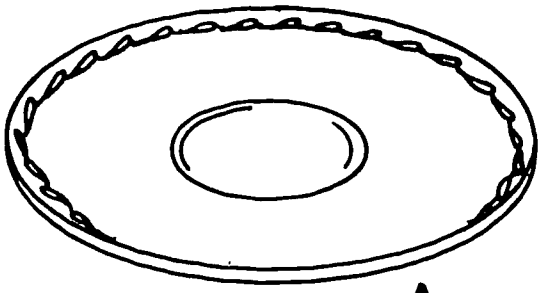

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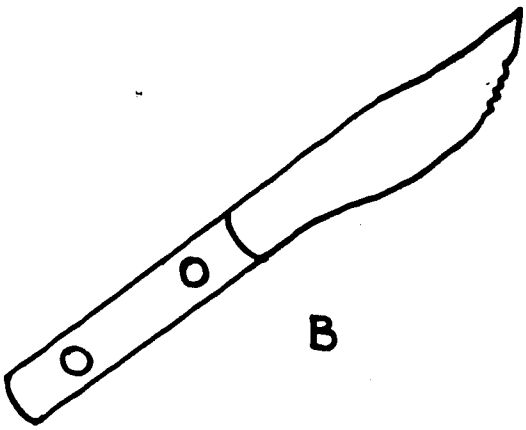

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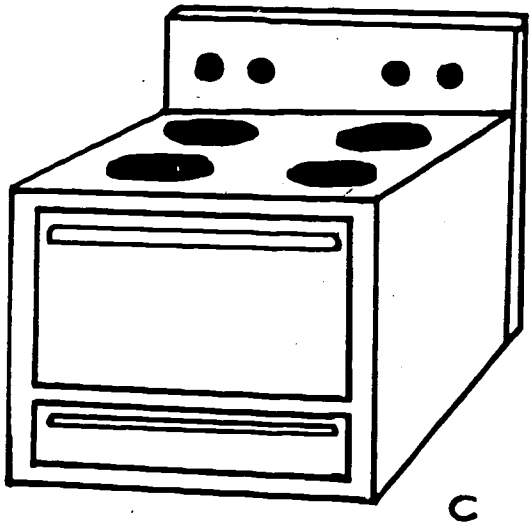

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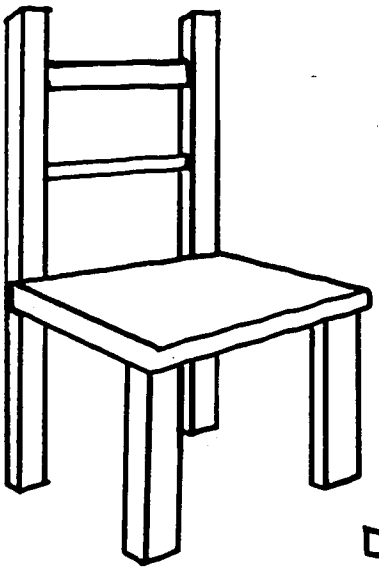

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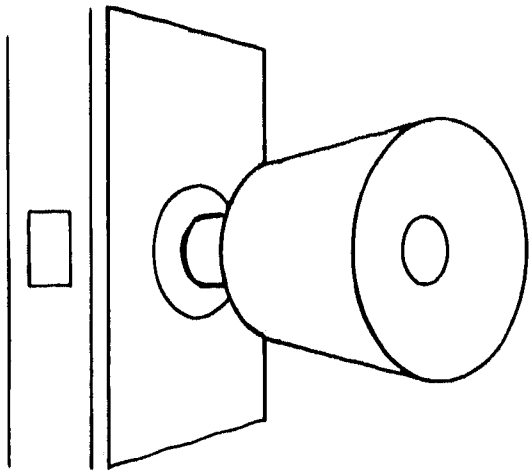

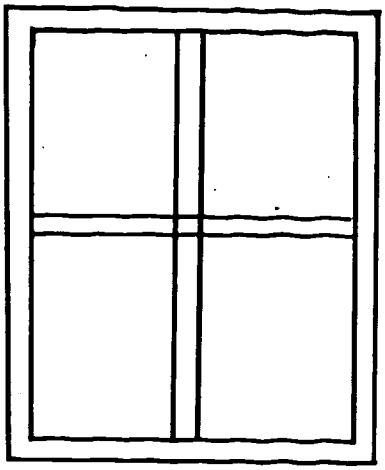

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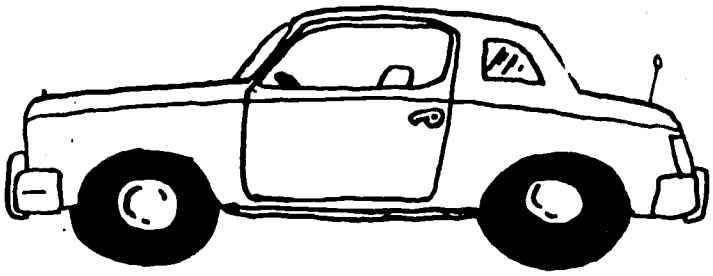

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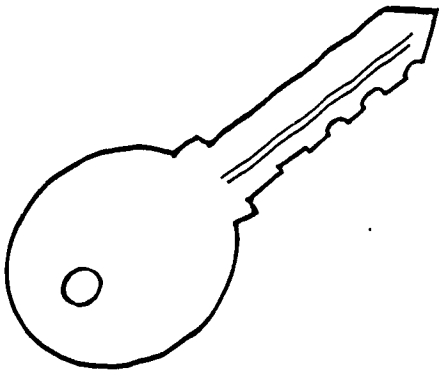

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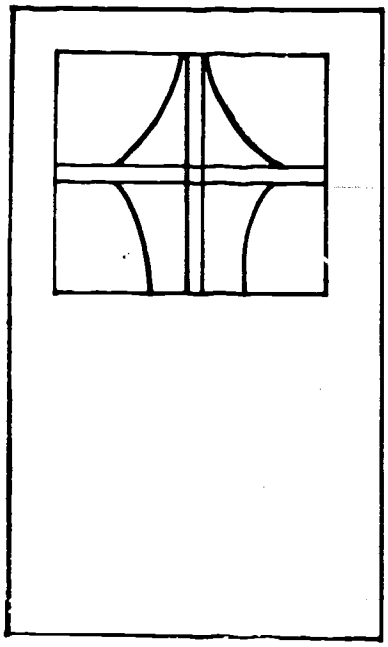

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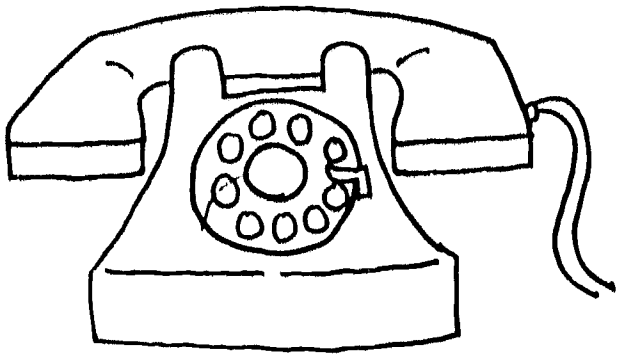

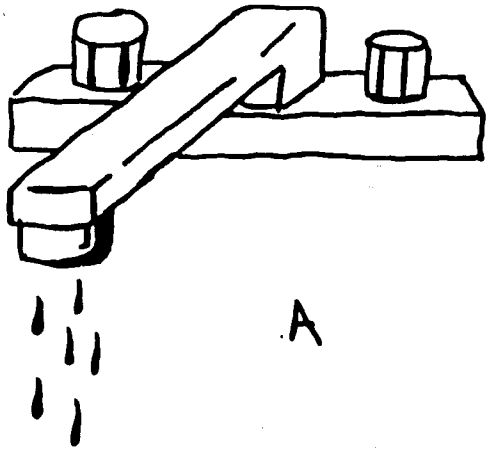

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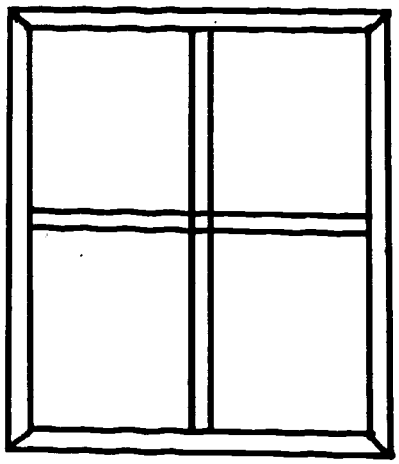

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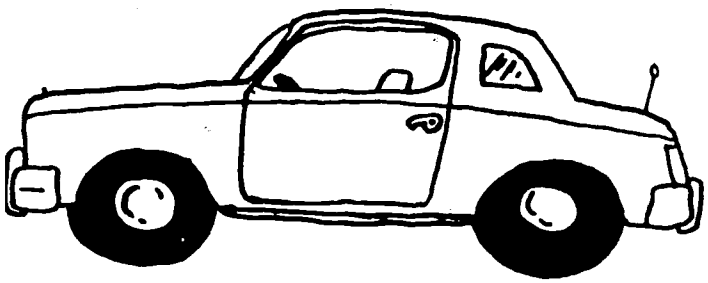

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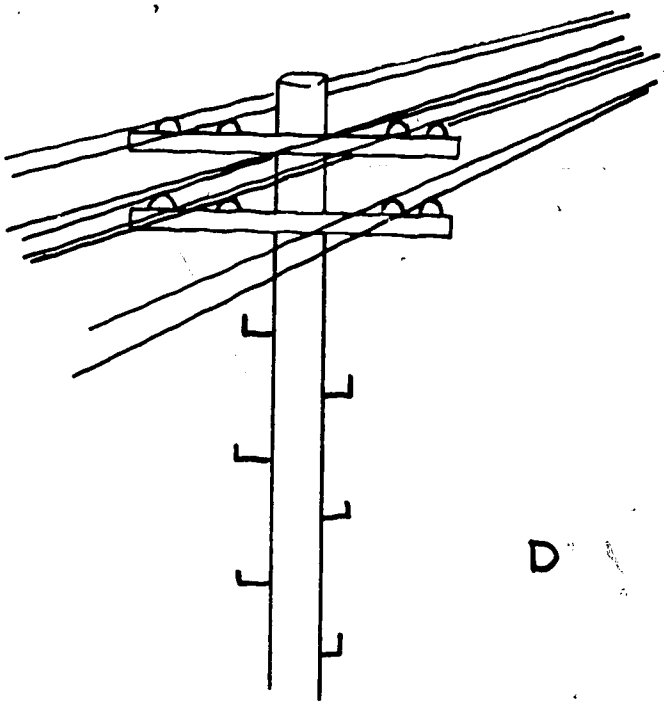

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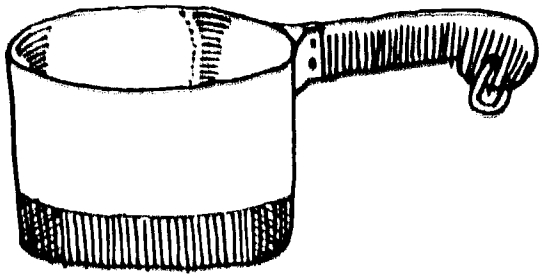

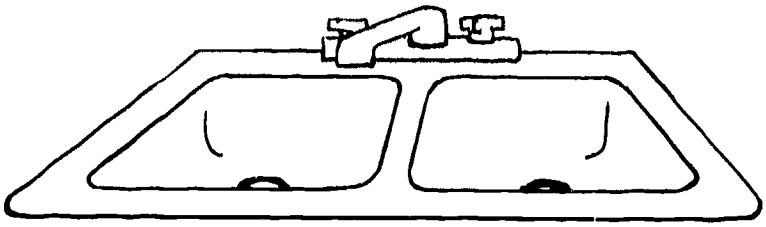

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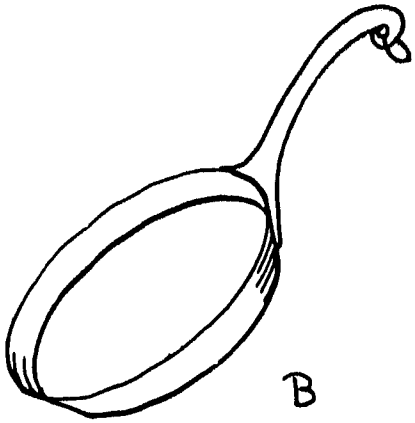

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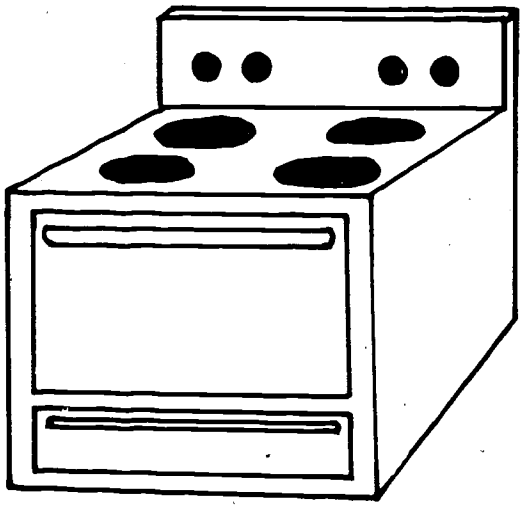

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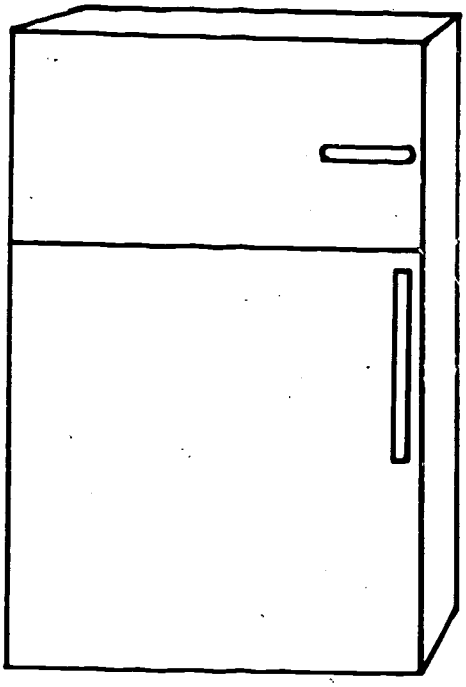

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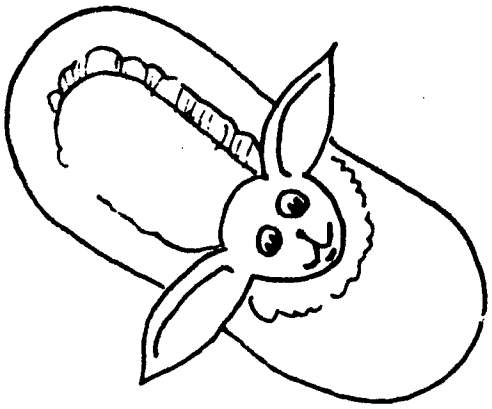
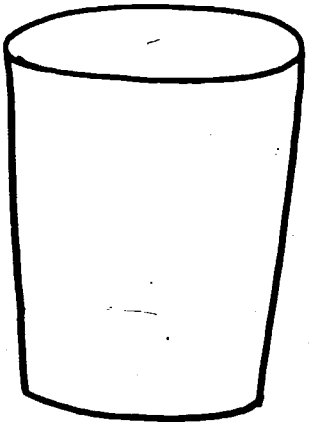
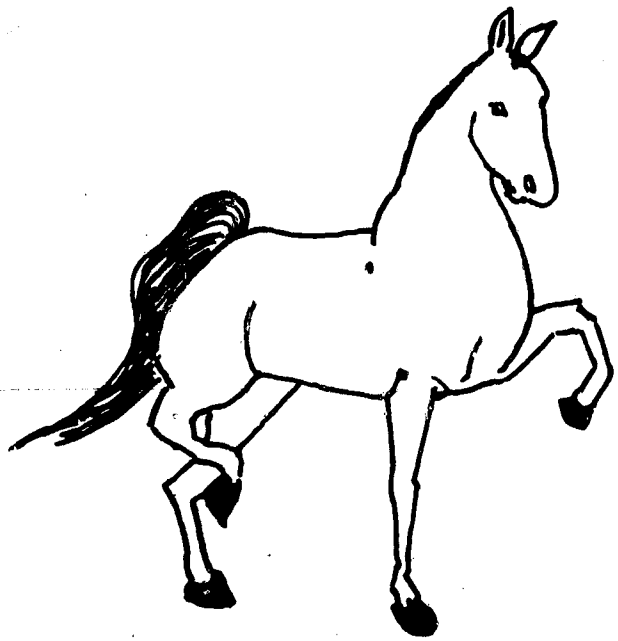
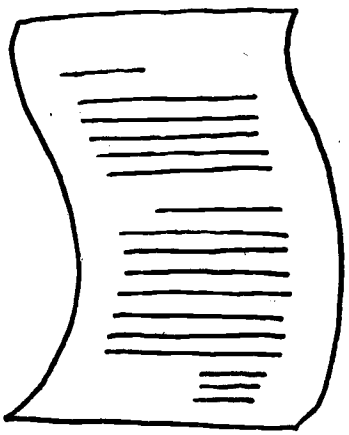
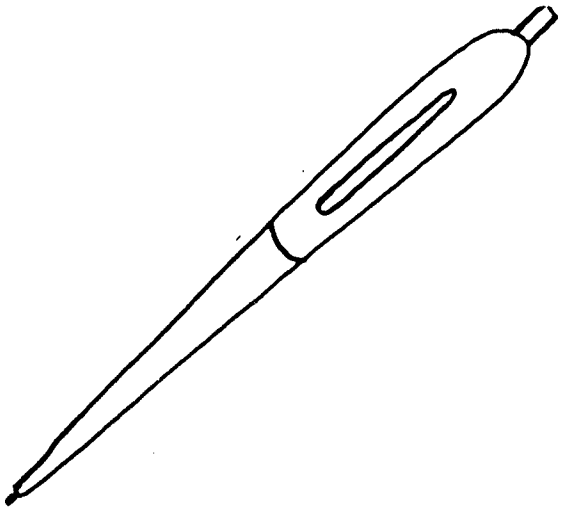
SECTION C

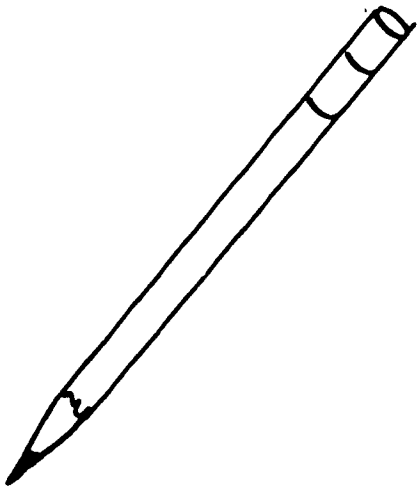


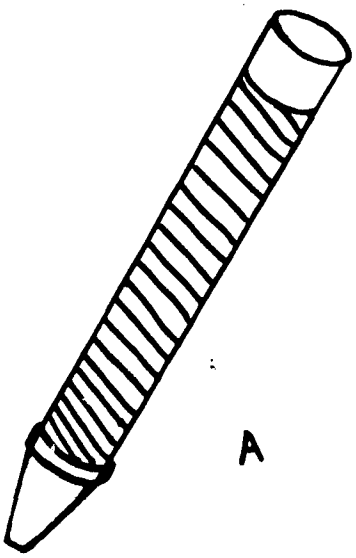












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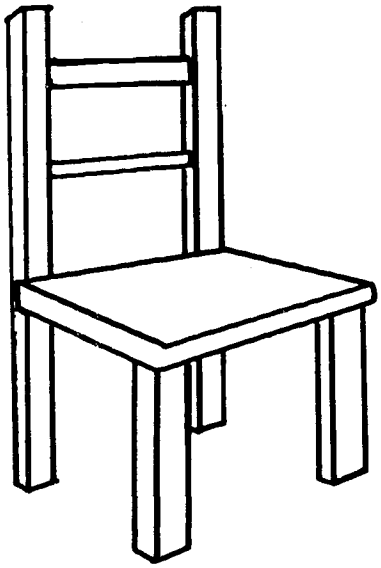

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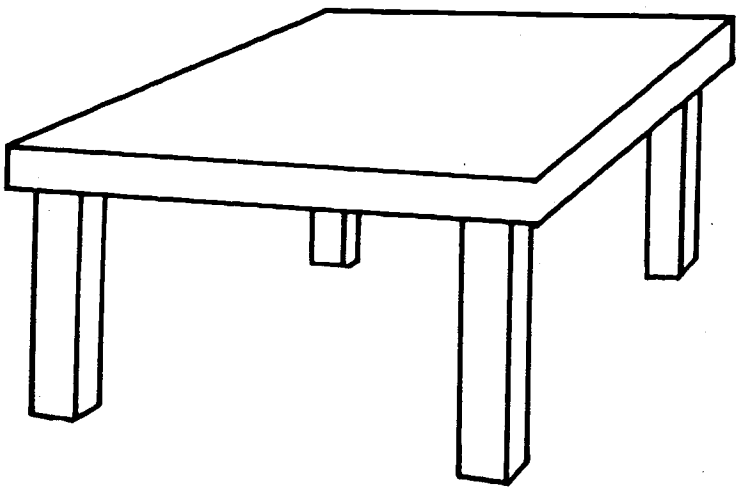

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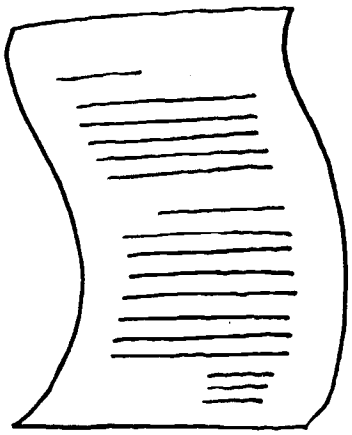

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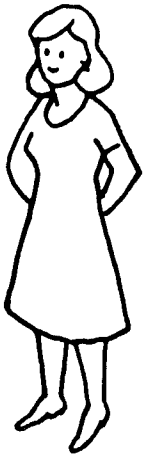

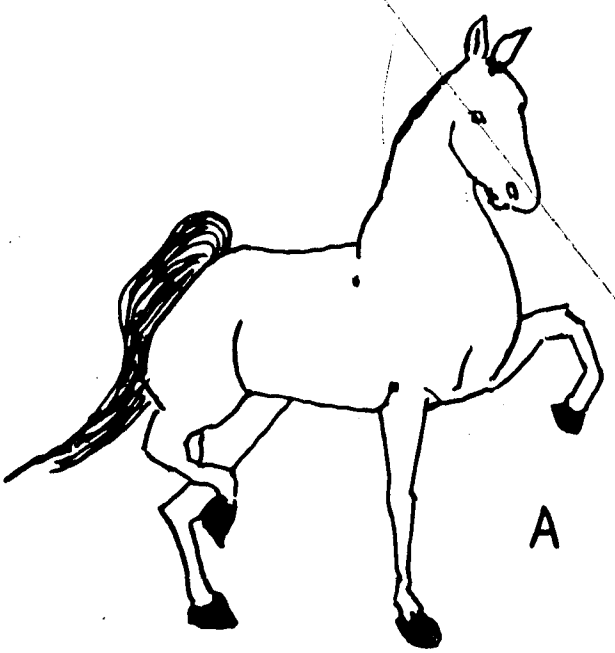

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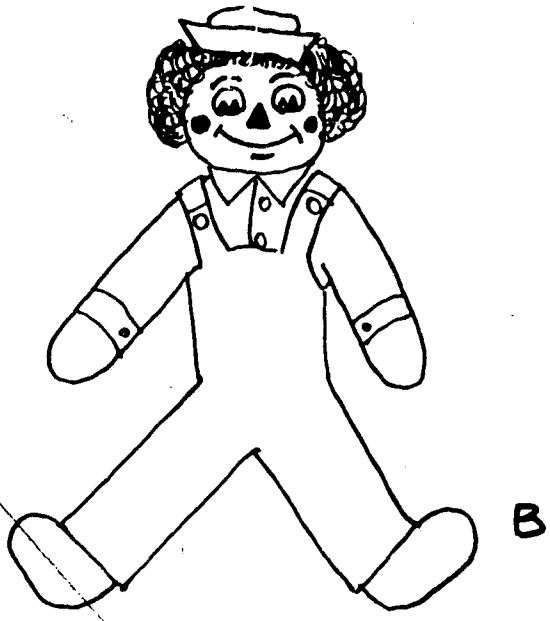

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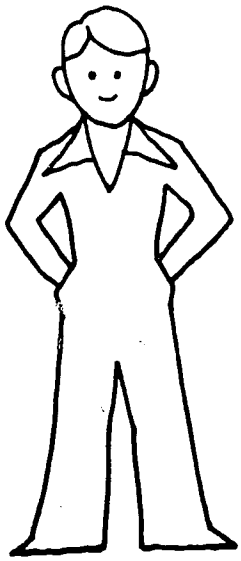

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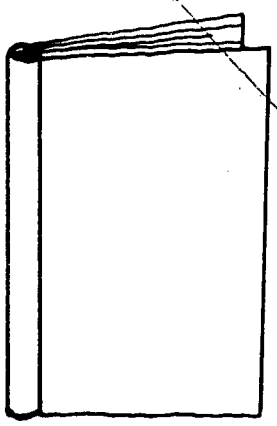

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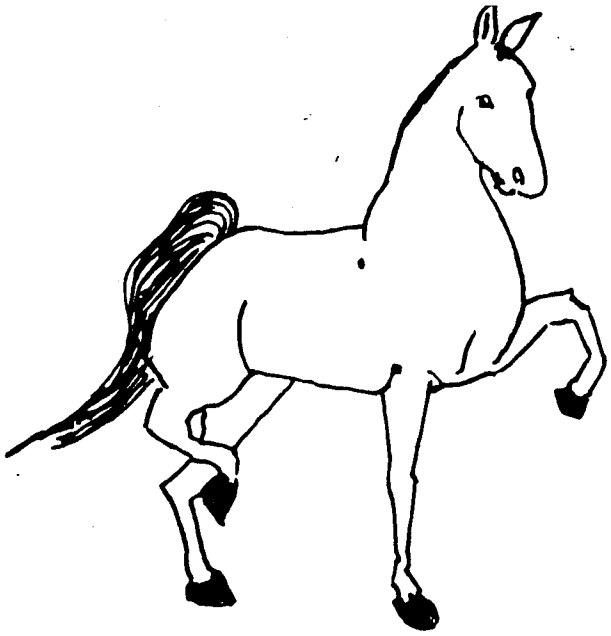

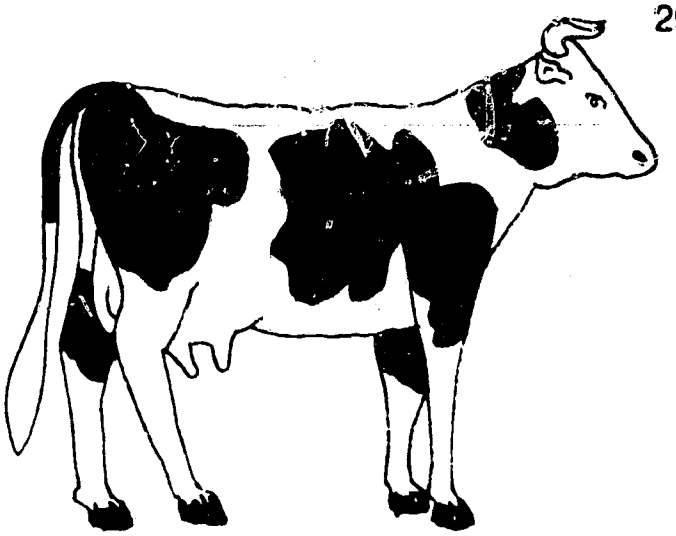

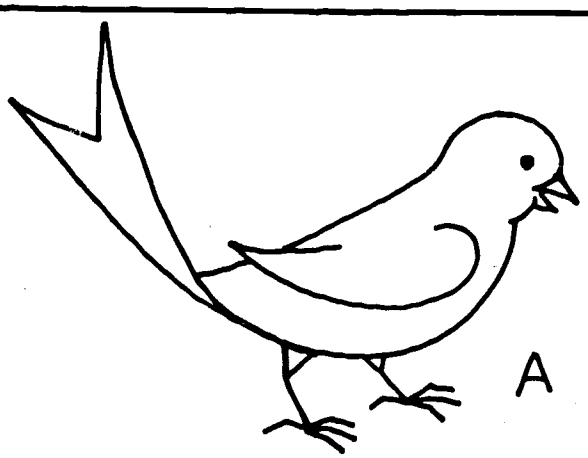

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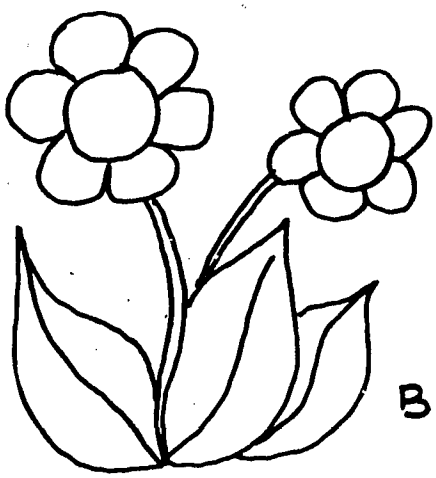

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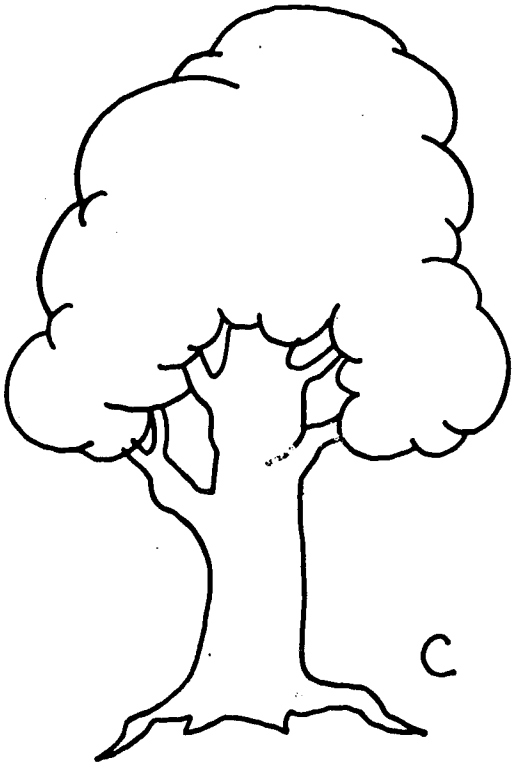

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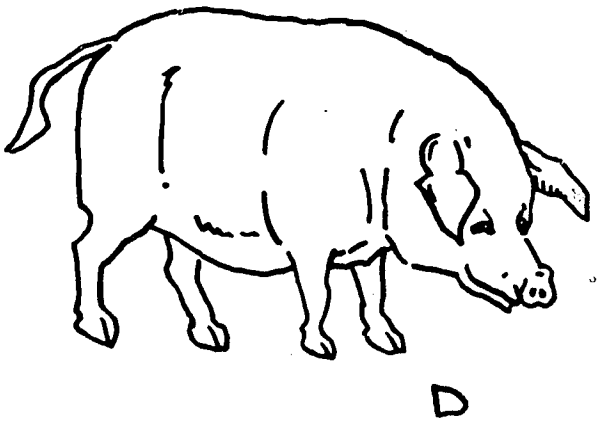

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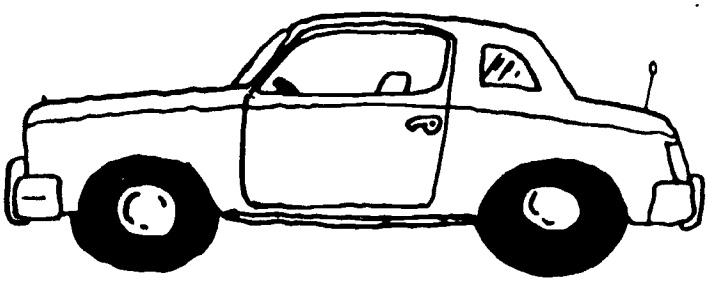

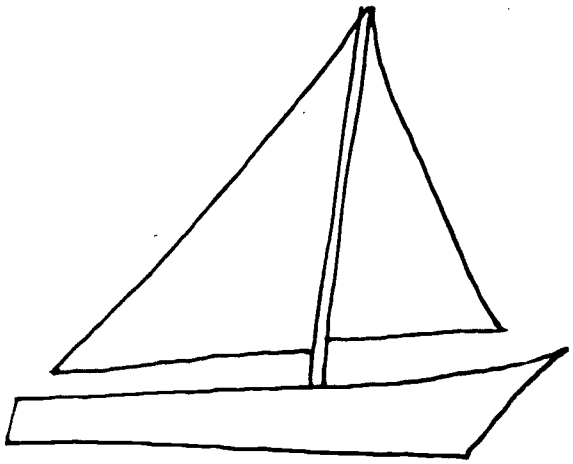

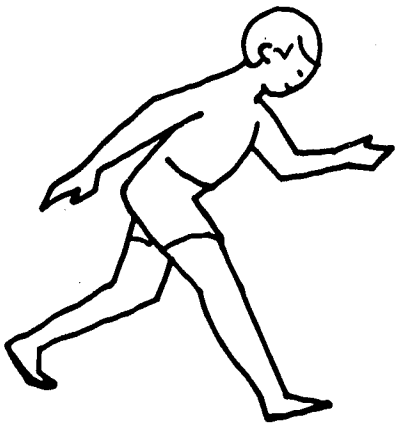

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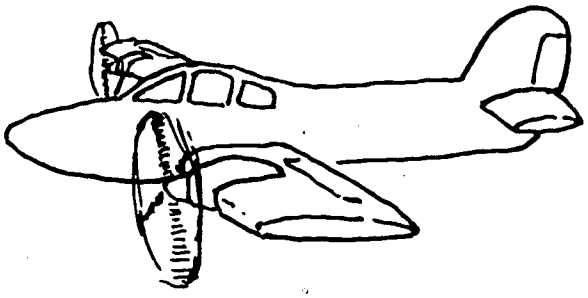

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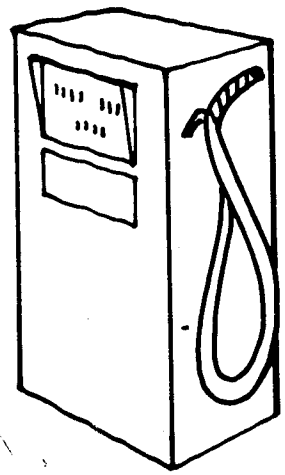

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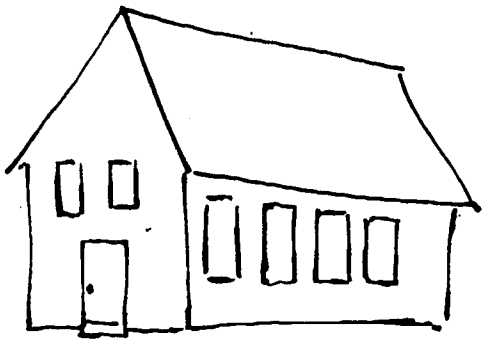

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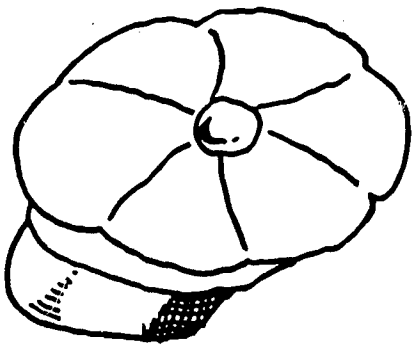

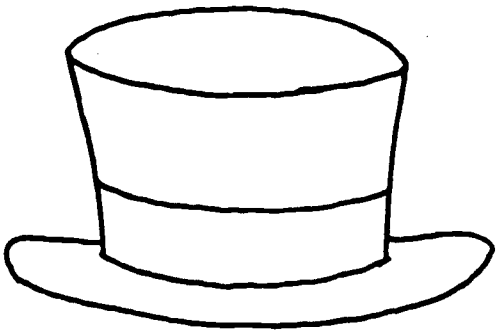

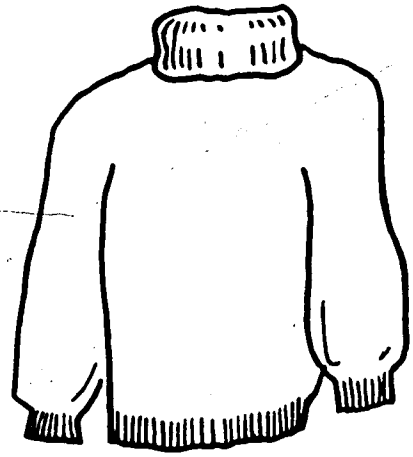

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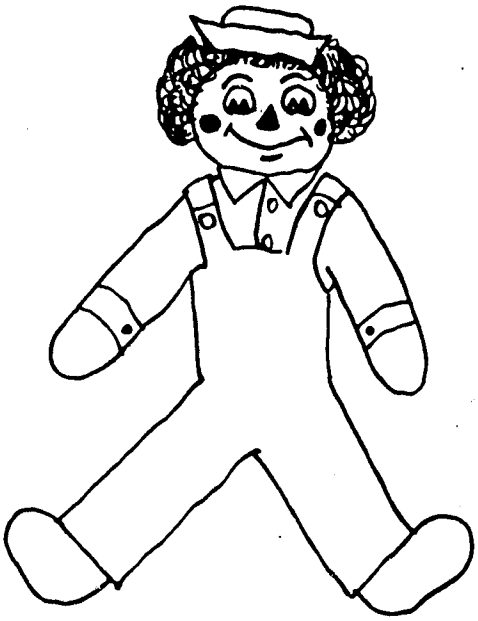

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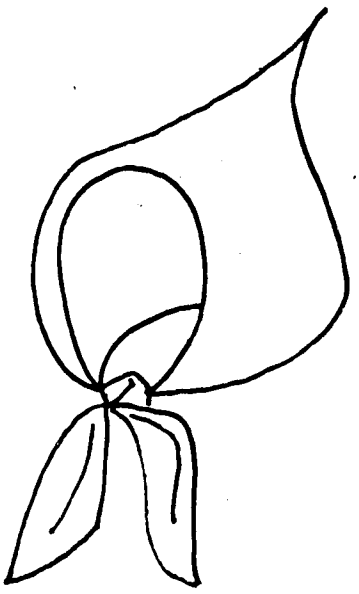

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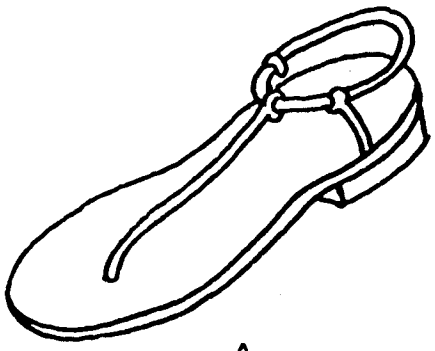

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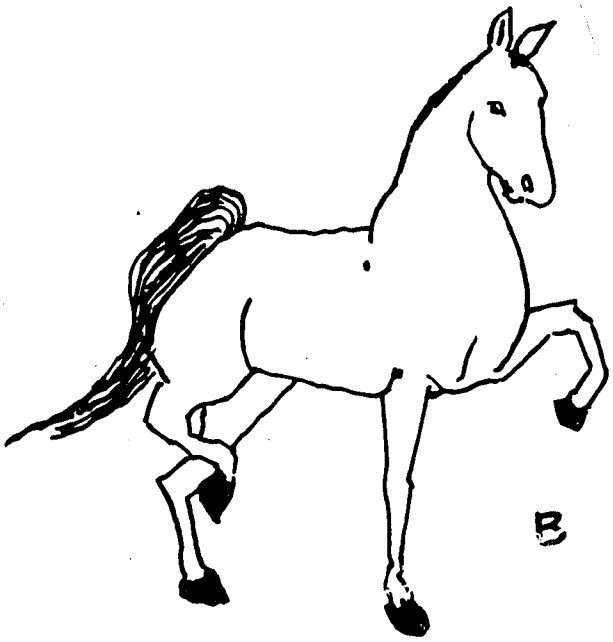

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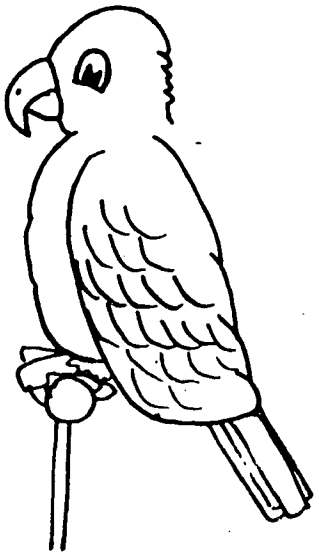

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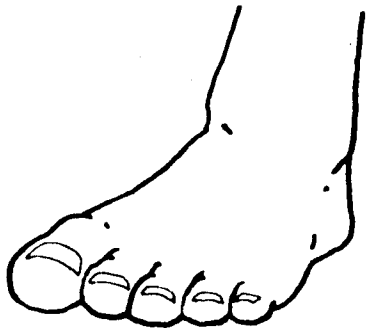

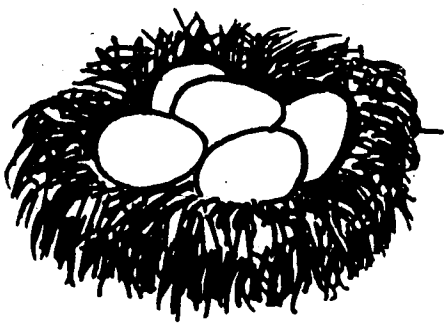

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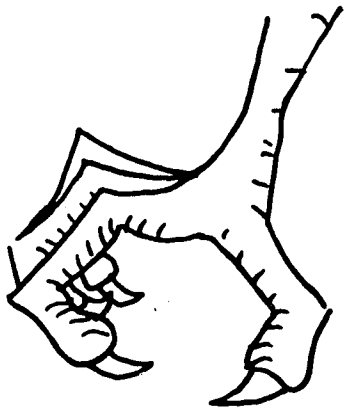

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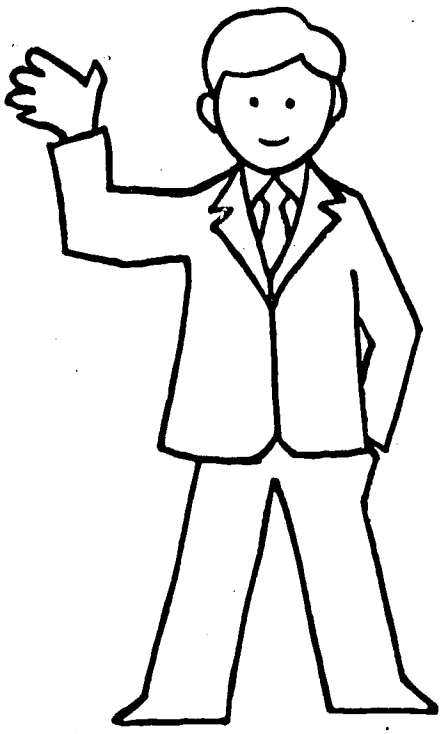

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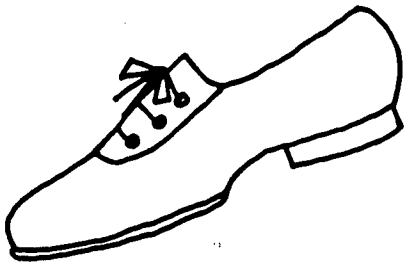

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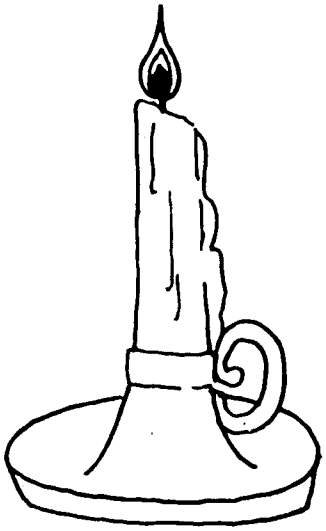

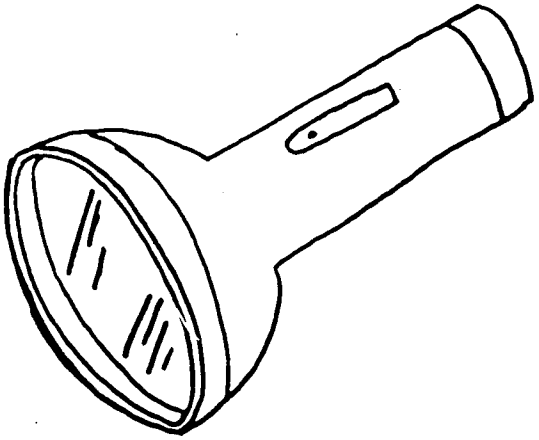

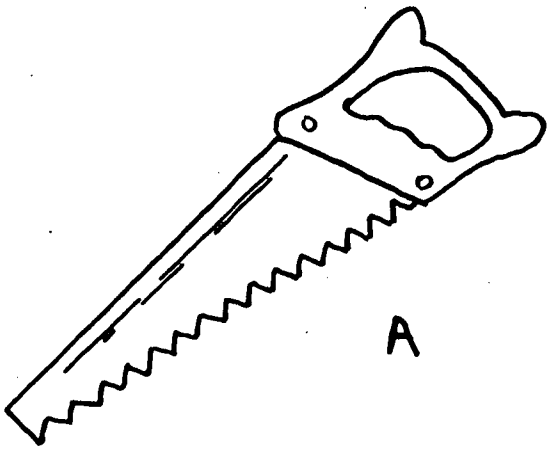

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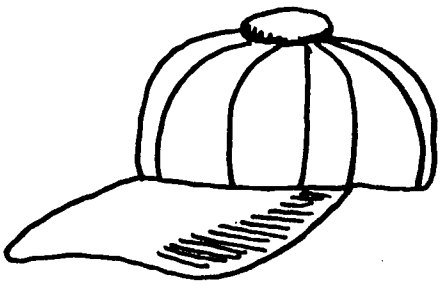

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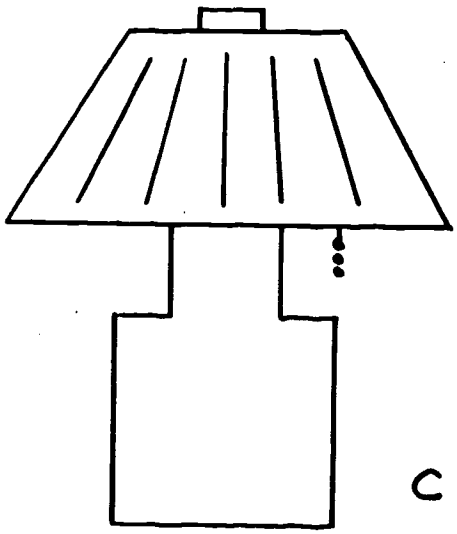

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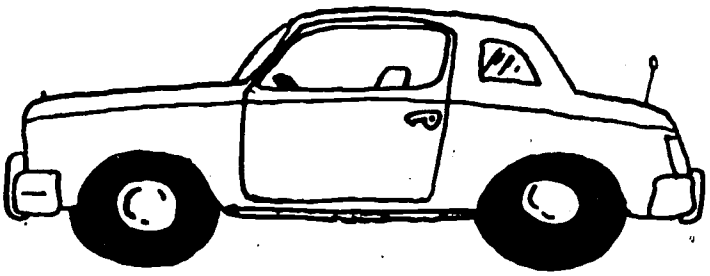

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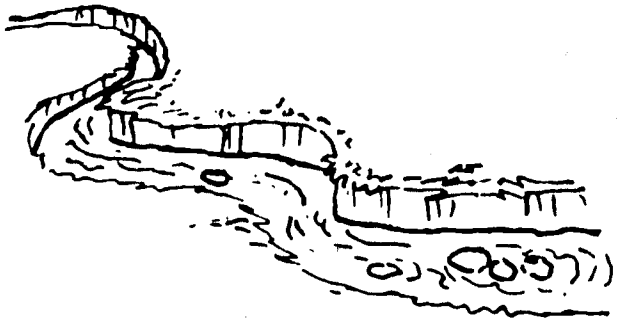

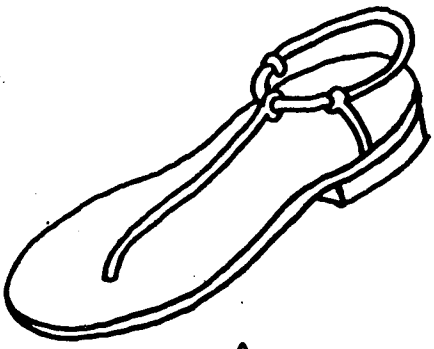

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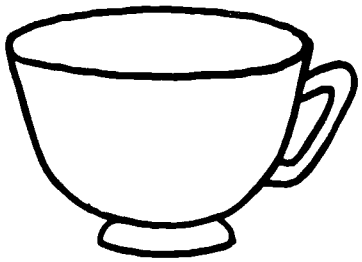

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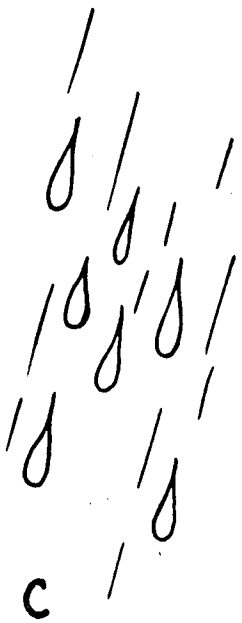

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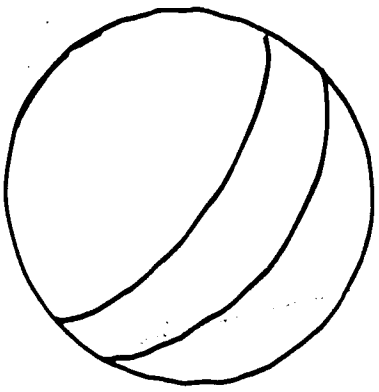

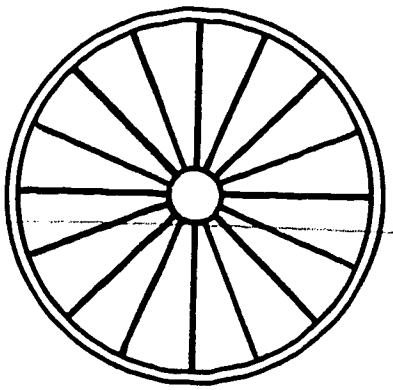

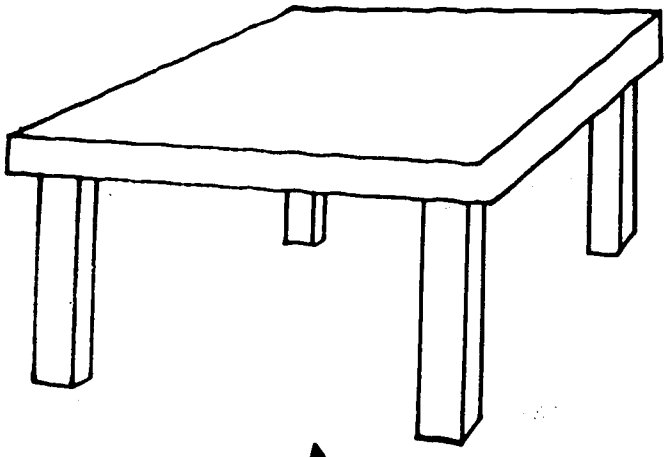

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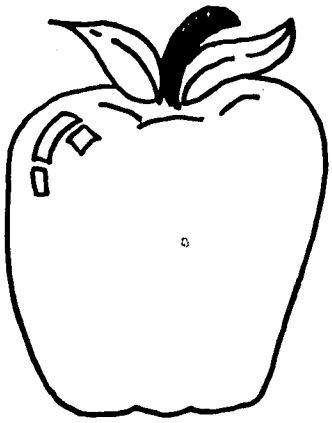

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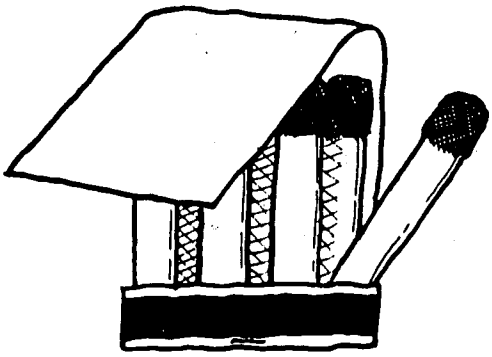

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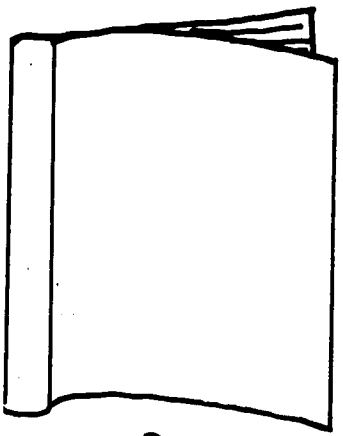

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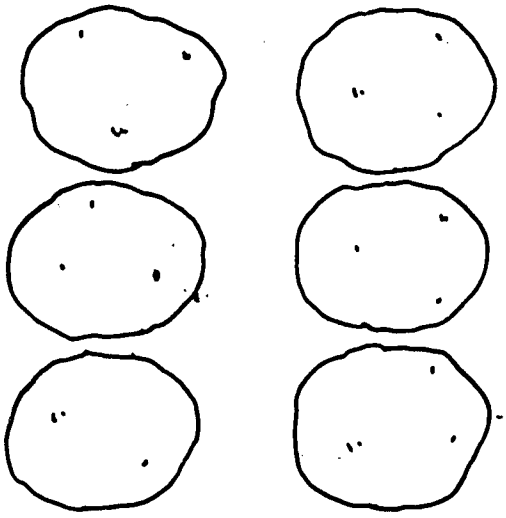

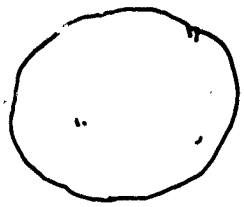

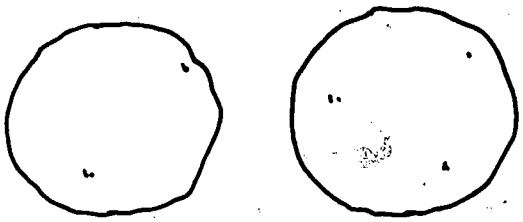

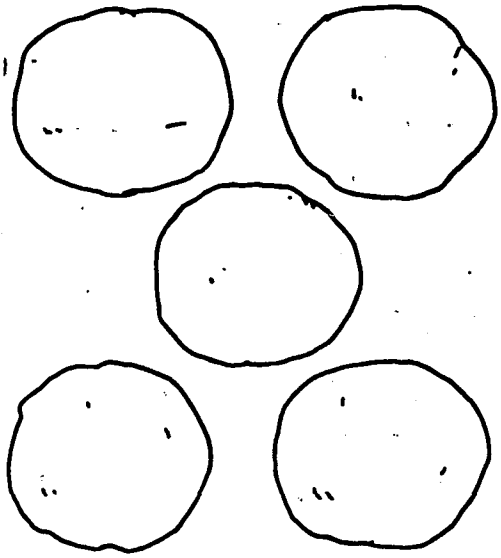

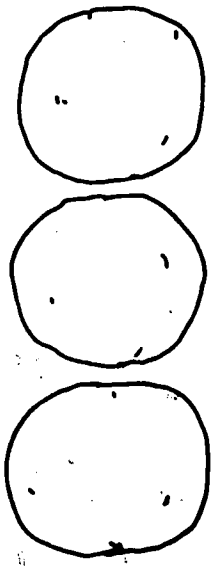

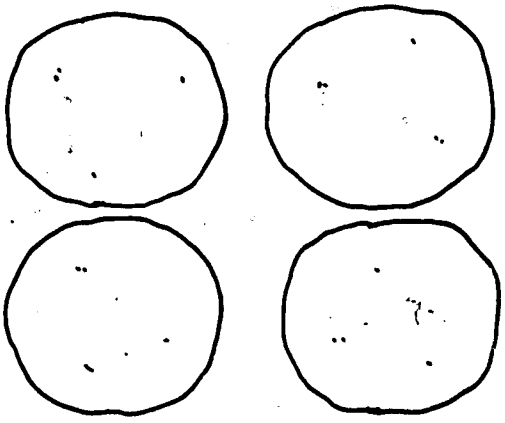

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